# Level Stress in North Scandinavian

Gjert Kristoffersen

University of Bergen

In this article I shall try to reconcile this conflict by arguing that the level stress effect, as I shall call it, is due to dealignment between tonal melody and the metrically strong syllable caused by the narrow temporal confines offered by words with light root syllables. This creates a sort of 'trompe-l'oreille' which leads the listener to hear a separate tonal accent on the second syllable, which again causes confusion with respect to which of the two syllables is the metrically strong one in the trochee formed by the two syllables that make up the level stress word.

North Scandinavian so-called level stress is a prosody connected with disyllabic words which have preserved light root syllables from Old Norse, such as in *vera* 'to be', *vika* 'week' and *sønir* 'sons'.[1] Dialects that manifest this prosody are e.g. North- and Middle Gudbrandsdal and East Telemark in Norway, and many of the dialects of the Dalarna and Nordbotten regions in Sweden. The analysis proposed in this article is based on data from the North Gudbrandsdal dialect (henceforth NGbr) in Norway and the Älvdalen dialect (henceforth Älvd) spoken in Dalarna in Sweden.

This article is organized as follows.

## 1 What is level stress?

As the term itself implies, level stress described as a pattern of more or less equal stress on both syllables. In NGbr the above words are realized as [ʊɛrɑ], [ʊɛtɑ] and [sy.ny] respectively, that is, as a complex consisting of two light syllables.[2] One of the better dialectological sources, Ekre (Ekre 1960: 11), describes the pattern as "[…] equal stress on both syllables, possibly accompanied by a weak tendency to lengthening and stronger stress on the second

[1] The 'root' syllable in these forms is the initial syllable and the one that is expected to carry the primary stress.

[2] Apart from marking of syllable boundaries by means of a punctuation mark, prosodic information has not been included in these examples. In later examples stress and tonal accent will be marked by a superscripted 1 for accent 1 and 2 for accent 2 before the root syllable.

syllable under emphasis, especially in sentence final position".[3] Similar descriptions are found in e.g. Storm (1884: 62f), Horne (1917: 9) on NGbr and in Levander (1925: 50) on Älvd Another important quality associated with the level stress pattern is variability: stress is sometimes heard predominantly on the initial syllable, sometimes on both and in rare cases on the final syllable. This variability is implied in the description of Ekre (1960) just quoted, and is more clearly stated by e.g. Larsen (1897: 41f), who says that in "North Gudbrandsdal […] both syllables are equally short and have an equal amount of stress, in the sense that there sometimes may be a little more [stress] on the first and sometimes a little more on the second [syllable]".

While descriptions such as those just cited may make sense within a dialectological framework, both the distributional and variable aspects implied by them are difficult to make sense of within contemporary metrical theory, on which most current analyses of stress are founded. Metrical theory (Hayes 1995) assumes that stress is a relational property between two syllables, where one must be the head of a foot constituted by two and thus be the syllable carrying stress. The absolute strong - weak relationship assumed to hold between the two constituents allows neither for the proportional distribution of stress nor for the variability of stress that are implied by the traditional descriptions of level stress cited above.

A fundamental problem with the dialectological descriptions reported above, is that stress, appears as a pre-theoretical concept that is more or less taken for granted. More precise phonetic descriptions than those cited above are not available from the traditional sources. This makes it difficult to distil from the sources what exactly led the authors to perceive the stress as level.

One reasonable hypothesis might in fact be that the perception of the stress being level can be attributed to the fact that the first observers in the final half of the 19$^{th}$ century spoke varieties of Norwegian where stressed syllables were obligatorily heavy, cf. Kristoffersen. (2000: chapter 5). Filtered through their perceptional categories associated with stress, the light root syllable might emerge as not fully stressed. Another property of level stress words that might have reinforced this effect is that the final syllable in the level stress words has retained its full vowel quality from Old Norse. Unstressed syllables following *heavy*, stressed syllables have on the other hand been reduced to schwa in these dialects. Hence it would not be surprising if level stress forms were perceived as having less prominence on the root syllable and more on the following syllable than forms with heavy root syllables.

---

[3] Translations of citations from sources written in Norwegian and Swedish are by the author.

But the very fact that the final, presumably unstressed vowel has retained its full quality in these forms, as against the reduction in forms with heavy, stressed syllable, shows that diachronically, level stress cannot have been an epiphenomenon. And as we shall see shortly, level stress has given rise to changes that also prove it to be more than a misperception in the ears of non-native speakers of the dialect.

### 1.1 Diachronic evidence

As just noted, the supposedly (partially) stressed, final vowel in level stress words and the corresponding unstressed vowels in disyllabic words with heavy (and fully stressed) root syllable, have undergone different developments since the Old Norse (henceforth ON) stage. Thus the NGbr correspondent of Old Norse *vera* 'to be' is [ˀʋɛ.ɾɑ], while Old Norse *kasta* 'to throw' shows up as [ˀkɑs.tə]. The full quality of the second vowel has in other words been preserved in words with light root syllable, while the corresponding vowel in words with heavy root syllable has been reduced to schwa.

This development is found in East Norwegian dialects and in a substantial number of Swedish dialects, and not only in the few dialects that have retained light root syllables to our times. On the assumption that the development is caused by the difference in root syllable structure, it is therefore commonly assumed that the level stress pattern has had a much wider distribution than it has today. The post-Old Norse quantity shift (see e.g. Riad 1992:chapters 5-6) caused light stressed syllables to expand into heavy in many dialects, but without concomitant or later elimination of the split in the unstressed vowels.[4]

A reasonable explanation of this pattern would be that (some degree of) stress on the final syllable has blocked reduction, since only unstressed vowels are known to reduce. The fact that reduction of unstressed vowels in fact was an active process in the languages, strongly suggests that those vowels in weak metrical positions that did *not* undergo reduction, in some sense or other was not completely unstressed.

---

[4] Thus south of the NGbr region we find [ˀʋæːɾɑ] with lengthened vowel and retained full final vowel, and [ˀkɑs.tə] with reduced final vowel. This split today constitutes the major division between East Norwegian and West Norwegian dialects. Those dialects that manifest traces of the split, referred to as 'jamvektsregelen' (the level stress rule), are counted as East Norwegian, while those where unstressed vowels underwent the same development irrespective of the weight of the root syllable, are counted as West Norwegian. See maps in e.g. Skjekkeland (1997: 251) or Sandøy (1996: 229).

A development that supports this assumption in an even more striking way, is the development into final main stress that has taken place in East Telemark further south in Norway, and in the Dalarna East Mora dialect spoken immediately southeast of Älvd The descendant of Old Norse *eta* 'to eat' in the traditional Tinn dialect of East Telemark is [œ.[1]toː], while in East Mora, Old Swedish *lesa* 'to read' shows up as [lɛ.[1]soː].[5] In words with etymological heavy root syllables, stress is maintained on the root.

Note the rounding of the final vowel in both dialects, which is usually explained by the common North Scandinavian rounding of *long* /a/ that took place during the late Medieval Age. For this explanation to go through, the final vowel must have lengthened at some stage prior to the rounding. As in modern Scandinavian, long vowels in Old Norse are only found in stressed syllables. Hence the lengthening will have led to these vowels being perceived as stressed. Apart from the rounding, there is scant evidence of this assumed length today. In fact, since long vowels imply stress, long final vowels are only found in the dialects referred to above, East Telemark and East Mora, where the main stress has moved to the final syllable.

### 1.2 Recent metrical analyses of level stress

In two recent analyses, both based on metrical theory, the level stress pattern is accounted for by means of a special foot type. In Tomas Riad's (1992) analysis, level stress is accounted for by a so-called unipositional foot (p. 189, 195f). The defining feature of this foot type is that both constituents of a bimoraic foot are parsed as one head. The result is a binary foot with no non-head and two constituents making up the head. In Patrik Bye's (1996) analysis, the diametrically opposite view is taken in that both moras are analyzed as separate heads within the same foot. In both cases, the weak member of the foot is eliminated in favour of two (equally) strong constituents.

There are several problems with these analyses. One is typological, in that both are based on foot types that seem otherwise unattested. In the absence of corroborating evidence, the structures proposed by Riad and Bye thereby reduce to ad-hoc devices without explanatory power. They also go against the basic tenet of Metrical theory that stress is constituted by a strong - weak relationship between the two constituents of a foot. Introduction of binary foot types

---

[5] These data have been taken from Skulerud (1922:133f) and Levander (1925:55f) respectively). The Tinn pattern, which was variable according to Skulerud, is probably extinct today, while the East Mora pattern was still in use among older speakers around 1990.

that violate this assumption would seem to rock the very foundation of Metrical theory as a theory of rhythm and prominence.

The main problem with both analyses, however, is in my view that they have taken the descriptions given in the dialectological literature at face value. At the outset, the perception of the stress pattern in these forms as level must be caused by certain properties of the acoustic signal. While it is uncontroversial that phonological analysis of a given pattern should be grounded in its phonetic realization, the underlying phonological structure cannot be directly inferred from phonetics. Only by combining phonetic facts about level stress with what is known about the general stress principles of the language will it be possible to construct an insightful phonological analysis of level stress.

Since the level stress pattern is still alive, it is in fact possible to obtain synchronic evidence such as recordings by which the phonetic differences between level and non-level stress realizations in these dialects may be elucidated. It is hardly probable that evidence will emerge from these data that will refute the analyses of Riad and Bye, or support one over the other, but it would at least be possible to establish the main phonetic differences between the two patterns. From these it may be possible to see how far standard Metrical theory will take us towards a more explanatory analysis.

Noe om at analysen i denne artikkelen ikke er en diakron analyse, og derved ikke kan bidra direkte til å forklare hvorfor vokalen i V2 ble bevart eller styrket.

## 1.3 Synchronic evidence

### *1.3.1 Stress realization in Norwegian and Swedish*

The two most important stress realization parameters in the majority of present day Norwegian and Swedish dialects are quantity and tonal accent. All stressed syllables are heavy, i.e. bimoraic. This requirement is implemented either by vowel length in open syllables or by a moraic consonant following a short vowel (Bruce 1998: 24ff; Kristoffersen 2000: chapter 5).

Unstressed syllables are normally light. In East Norwegian, vowels in Old Norse open unstressed syllables have been reduced to schwa, except in the level stress type, while in

Swedish, such reduction has not taken place. Thus Old Norse *kasta*, 'to throw', is realized as [ˀkɑs.tə] in East Norwegian and as [ˀkɑs.tɑ] in Swedish.[6]

In addition, primary stressed syllables are characterized by one of two tonal melodies, usually referred to as accent 1 and accent 2 (see e.g. Bruce 1977; Bruce and Hermans 1999; Kristoffersen 2000: chapter 9; 2006). In most dialects, accent 2 needs an unstressed syllable following the stressed one. Hence words with final stress, including monosyllabic words, always have accent 1, and the contrast between accent 1 and 2 is only manifested in polysyllabic words with non-final stress.

### *1.3.2 Quantity and accent in level stress words*

Based on the descriptions of level stress in dialectological sources, it is now possible to identify the necessary conditions for the level stress pattern to obtain with respect to the two stress realization parameters, i.e. quantity and tonal accent. We can in other words compare the realization of these parameters in disyllabic level stress and non-level stress words in the dialects under scrutiny. In this way we can identify the points where level stress words differ from those characterizing a 'normally' stressed word by means of a list of the features that could possibly account for the pattern, alone or in combination. This list is given in Table 1, where 'normal stress' refers to the obligatory features found in non level stress varieties. The prosodic type is the prototypical level stress CVCV structure. In order not to avoid circularity, I refer to the initial syllable that normally carries the primary stress as the root syllable, and to the final syllable, which is normally unstressed, as the final syllable.

| *Parameter* | *Normal stress* | *Level stress* |
|---|---|---|
| Weight of root syllable | Heavy | Light |
| Weight of final syllable | Light | Light (?) |
| Distribution of tonal accent | Both accent 1 and 2 | Only accent 2 |

*Table 1: Comparison of prosodic properties of level stress with normal stress in disyllabic CVCV domains*

We see that the only property that uniquely distinguishes the level stress pattern from the normal one is the weight of the root syllable, heavy in normal stress and light in level stress. The second property, light final syllable, seems to be common to both types, but we should

[6] We shall return to how Älvd distinguishes the final vowel in level stress words from those in words with normal stress below.

take note of the claims found in the sources that the final vowel in level stress words tends to lengthen. Hence the question mark in the level stress column. Given the fact that phonologically long vowels are restricted to stressed syllables in all Norwegian dialects, lengthening might make the final syllable in level stress words appear more stress-like.

Note further that a light root syllable is a necessary, but not sufficient condition for the level stress pattern to appear. Two other conditions must also be met: The final syllable must be headed by a full vowel in level stress words, and level stress words must be realized with tonal accent 2. The first of these is not a feature that distinguishes level stress from normal stress, since we also find full vowels in unstressed syllables following a heavy, fully stressed root syllable.

The second condition is more important, but not commonly noted.[7] It implies that CVCV words with accent 1 does not manifest level stress. Since accent 2 with very few exceptions appear in all words that were disyllabic in Old Norse, instances of disyllabic accent 1 words with light root syllables are hard to come by. The most important morphological category where accent 1 is found in polysyllabic words is the combination of a monosyllabic stem with the def. sg. suffix. In Old Norse we find so-called light, monosyllabic stems of a CV<C> shape, where <C> means that the final C as extrametrical. This means that when the vowel-initial def. sg. suffix is added to a stem of this type, the extrametrical C will surface as the onset of the final syllable, giving a CV.CV structure with light root syllable and accent 1. In most level stress dialects, however, light monosyllabic stems have lengthened, so that def. sg. forms invariably will have heavy root syllables. But in NGbr the short CV<C> stems have survived.[8] An example is the neuter root /nes/ 'peninsula'. The def. sg. suffix is /-ə/, giving [$^{1}$nɛ.sə] 'the peninsula'.[9] The dative def. sg. suffix, which triggers accent 2, is /-e/, giving [$^{2}$nɛ.se] 'the peninsula (dative)'. Speakers of the dialect confirm that only the latter manifests level stress. This shows that another necessary condition for level stress, in addition to the light root syllable, is tonal accent 2.

---

[7] To my knowledge, the first to notice this restriction was Ekre (1960).

[8] According to Gunnar Nyström (personal communication 2004), this type has also survived in one variety of the Swedish Älvdalen dialect.

[9] The suffix vowel is in some sources described as somewhat rounded. I disregard this aspect here as being irrelevant to the problem at hand.

The decisive conditions in other words appear to be light root syllable and accent 2. The explanation of the level stress effect must therefore be sought in the *combined* properties of light root syllable and the accent 2 melody. In addition, we must take into consideration the contextual features that are mentioned in the sources, utterance final position and emphasis, which suggests that lengthening of the final vowel may contribute to the level stress effect. Another relevant feature is vowel quality. The Norwegian and Swedish vowel inventories are in general quite symmetric with respect to length, but as in many other languages, short vowels are usually more centralized and lower than the corresponding long vowels. If the final vowel in level stress words has the more 'tense' quality of long vowels, this may also contribute to them being perceived as more stressed as the lax root vowel.

## 2 Phonetic analysis

### 2.1 Data

The analysis in this section will be based on recordings of speakers of the NGbr and the Älvd dialects made in 1989 and 1990. Eight male speakers from NGbr born between 1926 and 1952 and two speakers from Älvd, a man (born 1921) and a woman (born 1944) were recorded. Two of the NGbr speakers were recorded twice, in 1989 and 1990 respectively, so that there are ten recordings of this dialect. A set of target words, classified by the weight of the root syllable (heavy vs. light) and tonal accent (1 vs. 2) was included in the sample. All words were read in three different carrier phrases, all of which insured that the target words were read with a high degree of sentence stress and therefore tonal accent. In the first type of carrier phrase, the target words were final, while in the two others, they were non final, preceding either a clitic or another accented lexical word. Each sentence was read once by each speaker.

In order to reduce the possible impact of different intervocalic consonants, only tokens with intervocalic nasals are included in the analyses of duration, intensity and tonal melodies. In order to facilitate segmentation of the initial vowel, all onsets of initial syllables were voiceless. While this may have raised the F0 level at the beginning of the tonal span across the voiced VCV part of the target words, this influence is consistent across all tokens and it is therefore unlikely that it has biased the systematic differences we are looking for in any serious way. In the analyses of vowel quality, tokens with non-nasal intervocalic consonants

were used, in order to avoid any possible influence from vowel nasalization on the F1 and F2 readings.

Table 2 shows the target words from NGbr used in the analyses of duration, intensity and tonal accents in the upper section, and the target words used for the LPC analysis of vowel quality in the lower one.[10] [11]

| ***Accent 2*** | | ***Accent 1*** | |
|---|---|---|---|
| *Light root syllable( = level stress)* | *Heavy root syllable* | *Light root syllable* | *Heavy root syllable* |
| *Material for analysis of duration, intensity and tonal accent* | | | |
| /ko.mo/, *komme* 'to come' | /piː.nɑ/, *pina* 'the pain' | /ʂe.nə/, *skinnet* 'the shine' (non-dative) | /toː.ɳə/, *tårnet* 'the tower' |
| /se.nu/, *sene* 'sinew' | /ʂiː.nə/, *skinne* 'to shine/ | | /fon.ne/, *fonna* 'the snow fen' |
| /spo.no/, *spone* 'wooden shingle' | /pan.nɑ/, *panna* 'the forehead' | | |
| /sy.ny/, *sønner* 'sons' | | | |
| /ʂe.ne/, *skinnet* 'the shine' (dative) | | | |
| *Material used for analysis of vowel quality* | | | |
| /po.so/, *pose* 'bag' | | | |
| /so.go/, *sage* 'to saw' | | | |
| /sto.ko/, *stake* 'stick' | | | |

*Table 2: NGbr – Data overview*

Table 3 shows the corresponding target words used in the analyses of Älvd The words in the lower section were used for the analysis of intensity as well as of vowel quality.

| ***Accent 2*** | | ***Accent 1*** | |
|---|---|---|---|
| *Light root syllable( = level stress)* | *Heavy root syllable* | *Etymological light root syllable* | *Heavy root syllable* |
| *Material for analysis of duratio and tonal accent* | | | |

[10] For different reasons, but mainly because some readers inserted small pauses after target words in non-final position, the data sets actually used in the analyses below never consist of the full number of tokens.

[11] The NGbr words are rendered in standard Norwegian (bokmål) orthography, while the Älvd words are rendered in standard Swedish orthography.

| | | | |
|---|---|---|---|
| /kʉ.mo/, *komma* ‘to come’<br>/li.nʉ/, *lina* ‘line’ | /skai.nɑ/, *skinna* ‘to shine’<br>/sim.ma/, *simma* ‘to swim/ | /stʃiː.neð/, *skinnet* ‘the shine’<br>/tiː.neð/. *tennet* ‘the pewter’ | /stʃin.neð/, *skinnet* ‘the skin<br>/kwon.neð/, *kornet* ‘the grain’ |
| *Material used for analysis of intensity and vowel quality* | | | |
| /dro.go/, *dra* ‘to pull’<br>/fo.ro/, *fara* ‘to go’<br>/sko.ko/, *skaka* ‘to shake’<br>/to.go/, *taga* ‘to take’ | | | |

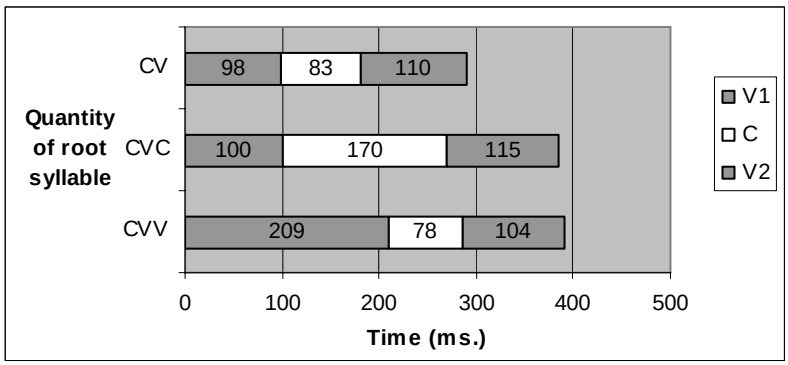
*Table 3: Älvd – Data overview*

## 2.2 Segment duration

### *2.2.1 North Gudbrandsdal*

Duration was measured with respect to the root vowel (henceforth V1), the intervocalic consonant (henceforth C) and the final vowel (henceforth C2).[12] Since the final vowel in all the level stress words are full vowels, only the full final vowels of the words with heavy root syllable have been included in the comparison of accent 2 words with respect to the duration of V2.[13]

In Figure 1 and Figure 2 the results for the two accent types in utterance final position are given.




[12] The phonetic analysis presented below is a condensed version of the analysis given in Kristoffersen (2007).

[13] In Kristoffersen (2007) it is shown that final schwas are shorter than full vowels in the same position. However, in phrase final position the difference is very small (129 vs. 122 ms.)

*Figure 1: NGbr – Segment duration in accent 1 words with light and heavy root syllables in phrase final position*

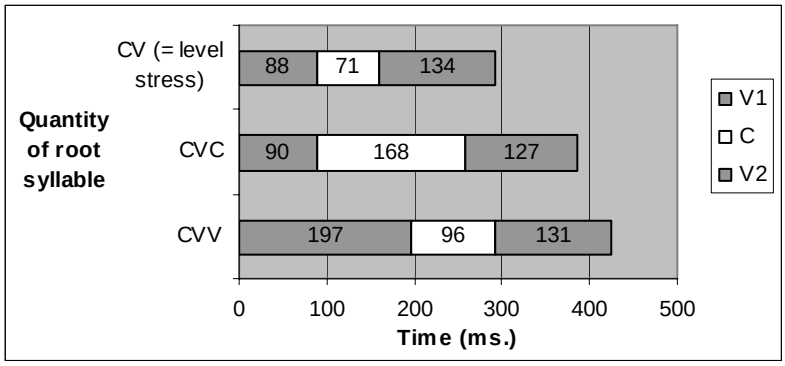



*Figure 2: NGbr – Segment duration in accent 2 words with light and heavy root syllables in phrase final position*

We see that both V1 and C in the short CV-type for both accents align with the short vowels and consonants of the two types with heavy root syllable. We can therefore conclude that V1 in level stress words (Figure 2) is short, and that the following C in parallel with the C following long vowels constitutes the onset of the second syllable, in contrast with the long consonant following short root vowels in the heavy type, which makes up the rhyme of the root syllable as well as the onset of the second syllable.

Note also that V2, especially for the accent 2 type, is considerably longer than the corresponding short V1. Since Figure 1 and 2 give the results in utterance final position, this may be caused by so-called final lengthening (see e.g. Nooteboom 1997). No systematic data exists that documents final lengthening in Norwegian, but Lindblom (1978 with references) has documented this effect for Swedish, and since the prosodic systems of Norwegian and Swedish are very similar, we would expect the same to be the case for Norwegian.

This assumption finds support when we compare the duration of V2 in level stress words in utterance final position with medial position. As can be seen from Figure 3, the difference between V1 and V2 only emerges in utterance final position. In medial position there is no difference between V1 and V2. This suggests that the level stress effect, which according to the sources cited above is especially strong in utterance final position, is reinforced by final lengthening.

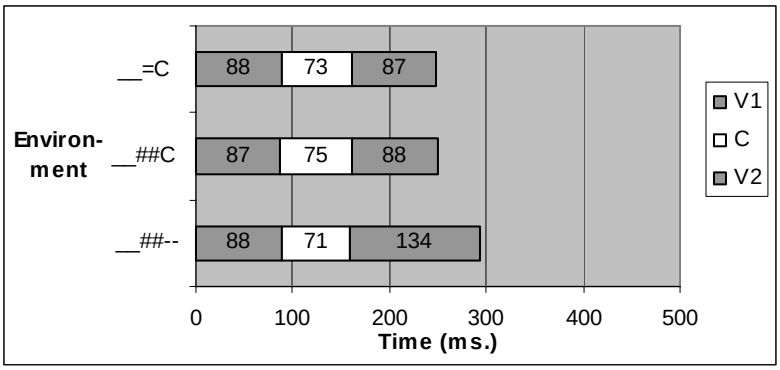



*Figure 3: NGbr – Segment duration in level stress words in utterance final and utterance medial position*[14]

But as can be seen from Figure 4 below, this to a certain degree also holds for accent 1 words with short root syllable. Also here we see that final lengthening produces a V2 that is longer than V1. But in medial position V1 is longer than V2, mostly due to shortening of V2.

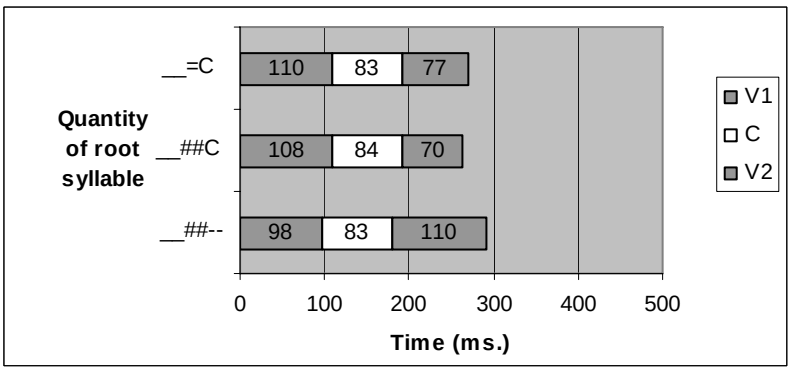



*Figure 4: NGbr – Segment duration in accent 1 words with short root syllable in utterance final and utterance medial position*

We cannot conclude that utterance final V2 should be classified as phonologically long based on the extra length. When we compare it with the durations of the phonologically long vowels in Figure 1 and 2, we see that there is a substantial difference between the about 200 ms. of the long vowels and the 134 ms. of the utterance final V2 of the level stress words. In addition, we see that there is no difference with respect to the utterance final V2 of the accent 2 words with heavy root syllable. Therefore, it cannot be the absolute length of level stress V2

in utterance final position that contributes to the level stress effect. Rather, it must be its relative length compared to V1. We shall return to this point below.

The relevant differences were tested by means of a one-way ANOVA with V1 in level stress words, V1 in words with long root vowel, V2 in level stress words and V2 in words with heavy root syllable as independent variables, and duration as the dependent variable.[15] The data set consisted of two accent 2 words with long root vowel and 2 level stress words read by eight speakers in phrase final position. Post-hoc comparisons (Tukey) gave the following results.

| | |
|---|---|
| Difference between long V1 and short (level stress) V1 | p = 0,000 |
| Difference between long V1 and V2 in level stress words | p = 0,000 |
| Difference between V1 and V2 in level stress words | p = 0,000 |
| Difference between V2 after heavy root syllable and V2 in level stress words | p = 0,986 |

*Table 4: NGbr – Results of statistical testing of durational differences*

From the first two rows in the table wee see that both vowels of level stress words are different from a long vowel. V2 of level stress words can in other words not be classified as phonologically long by simple, durational criteria. On the other hand, we also see that the final vowel in level stress words is significantly longer than the root vowel. But since there is no significant durational difference between V2 in level stress words and words with heavy root syllable, this difference is not a unique property of level stress. Given the fact that V1 and V2 have the same duration in non-phrase final position, as shown in Figure 3, the most plausible interpretation of the results given in Table 4 is therefore that the final vowel in level stress words is phonologically short, but subject to *general* lengthening phrase finally.

### *2.2.2 Älvdalen*

Since the amount of data is much more limited, the results from Älvd with respect to duration can only be used as supporting evidence, and only to the extent that they conform with the results established for NGbr. Since level stress is confined to accent 2, and since there are no

---

[14] Explanation of legend: __=C: medially before a consonant initial clitic, __##C: medially before a consonant initial word and __##--: utterance final.

[15] All tests were run by means of the SPSS software.

longer any short root syllables in accent 1 domains in the variety analysed here, we shall only look at the results for accent 2. In Figure 5 and 6 we see that the durational differences come quite close to those found in NGbr.

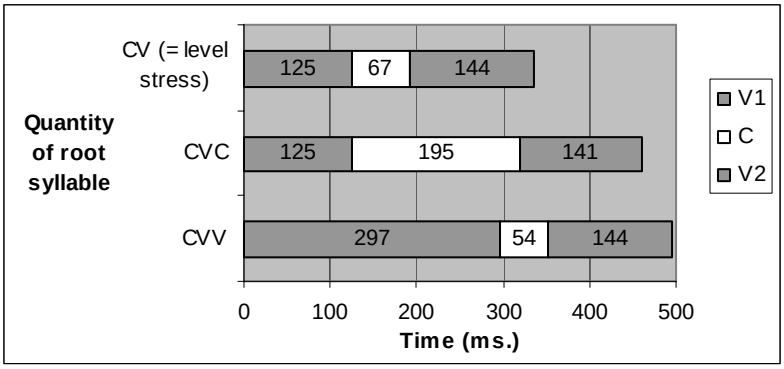



*Figure 5: Älvd – Segment duration in accent 2 words with light and heavy root syllables in phrase final position*

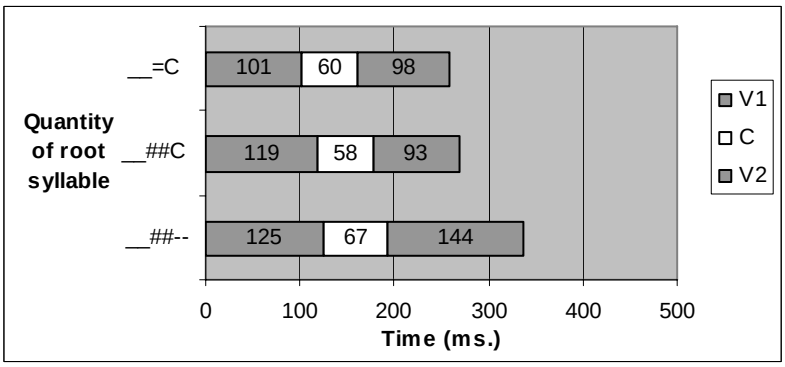



*Figure 6: Älvd – Segment duration in level stress words in utterance final and utterance medial position*

V1 and C of the level stress words correspond to the short V1 in the heavy CVC type and the short C of the heavy CVV type respectively. The duration of V2 is the same over the three quantity types in phrase final position. The difference between V1 and V2 in level stress words in phrase final position is smaller, and interestingly, V2 is shorter than V1 in phrase medial level stress words, as shown in Figure 6. We can therefore conclude that with respect to duration, the differences between level stress words and accent 2 words with heavy V1 and initial stress are the same in NGbr and Älvd This means that in both dialects, a light root syllable is a necessary condition for level stress to be manifested, and in both dialects, V2 is longer than V1 in phrase final position, which is one of the prototypical level stress

environments. This length is on the other hand most likely the effect of general utterance final lengthening, as shown by Figure 3 and 5.

### 2.3 Intensity

Traditionally, intensity has been regarded as the most important diagnostic for phonetic stress. This has also been the case for Norwegian, where stress in the traditional literature is often referred to as expiratory, see e.g. Storm (1884: 37). This term refers at the outset to greater muscular effort being expended on driving the exhalation of air through the oral and nasal cavities during articulation of stressed syllables. Its auditory effect is assumed to be greater loudness or intensity.

However, research on the phonetics on stress realization since the 1950's has led to the view that loudness plays an insignificant role in stress realization (Hayes 1995: 5ff; Gussenhoven 2004: 12ff). This might suggest that we could leave intensity out of the investigation, but in recent years, intensity has enjoyed a certain renaissance as a potentially relevant parameter. Sluijter and van Heuven (1996) suggests that stressed and unstressed vowels can be distinguished by so-called spectral tilt, in that unstressed vowels tend to have less intensity in the higher parts of the spectrum than stressed vowels. Others, such that Beckman and Pierrehumbert (1986) and Gordon (2002; 2004) claim that loudness combined with duration renders a more precise measure of phonetic stress than duration alone.

In light of this, and since level stress is so poorly understood, there are good reasons to include measures of intensity, provided that we can find a consistent way to measure it and at the same time be as sure as possible that the measures obtained captures the linguistically relevant properties of the intensity in the signal. An additional factor is that since level stress clearly must be the product of non-categorical perception in some sense, it must be the *perceived* relative intensity that is potentially relevant, not the raw acoustic scores per se.

Gordon (2004: 293) describes a method for measuring what he calls *total perceptual energy*, defined as "the integration of energy over time in the perceptual domain". This measure can be obtained by using the Cricket 2.0 software, which has been specially designed for this task by Gordon and his co-workers.[16] In the introduction to the program in the help files, Cricket is described as "an acoustic analytical tool used to quantify prominence both acoustically (as the integration of intensity over time) and perceptually (as the integration of intensity over time in the auditory domain through the application of a series of filters

reflecting well established auditory phenomena)." The software in other words measures both acoustic intensity and renders an estimate of perceived intensity. The results of the measurements are presented in the next sections.

### *2.3.1 North Gudbrandsdal*

Only V1 and V2 in words with short root syllable were measured. Since the level stress effect is limited to accent 2, we must not only be able to show that perceived intensity is close to equal with respect to V1 and V2. We must also be able to show that accent 1 and accent 2 are different before we can conclude that different (or identical) levels of intensity contributes to the level stress effect. Therefore, the only accent 1 word with short root syllable in Table 2 above, /ʂe.nə/, *skinnet* 'the shine' (non-dative), was included in the sample in addition to three level stress words, /ko.mo/, *komme* 'to come', /spo.no/, *spone* 'wooden shingle'. Since vowel quality may influence both production and perception of intensity, it is important to use words with identical vowels (vowel levelling, see section 2.4 below) in the data set. In addition, the available tokens of the level stress form /ʂe.nɐ/, 'the shine', which is the dative form of the accent 1 form used, was included.

What is of primary interest here are *differences* between V1 and V2 for each token, the hypothesis being that in level stress words the amount of relative intensity in V2 will be greater than in accent 1. If differences in levels of intensity contribute to the level stress effect, we will in other words expect at least the same amount of intensity in V1 and V2 in level stress words, compared to accent 1, where we will expect V1, the stressed vowel to have more intensity than V2. But we also know that level stress is more easily perceived in utterance final than in utterance medial position. We therefore expect that the measures of V2 intensity will be higher in final than in medial position in level stress words. This means that we must control for environment in addition to tonal accent.

Since intensity as measured in Cricket is a function of time, there will be a strong interconnection between duration and intensity, which accordingly cannot be treated as independent factors. In order to test to what extent acoustic and perceived intensity can be predicted from duration, vowel duration was first correlated with both acoustic and perceived intensity for V1 as well as V2 for each tonal accent and across environments. The results are given in Table 5.

---

[16] At the time of writing Cricket was available from www.uweb.ucsb.edu/~cmnash/academic/cricket.

| | | *Acoustic intensity* | | *Perceived intensity* | |
|---|---|---|---|---|---|
| | | *R* | $R^2$ | *R* | $R^2$ |
| Accent 1 | V1 | 0,985 | 0,970 | 0,834 | 0,695 |
| | V2 | 0,994 | 0,988 | 0,834 | 0,696 |
| Accent 2 | V1 | 0,961 | 0,924 | 0,616 | 0,379 |
| | V2 | 0,979 | 0,958 | 0,581 | 0,338 |

*Table 5: NGbr – Correlations between vowel duration and intensity measures*

Starting with the acoustic intensity, we see that there is a very close relationship with duration. The fact that all correlations are above 0,95 means that more than 90 % of the acoustic intensity measure is directly accounted for by duration, as expressed by the squared R-score. When it comes to perceived intensity, however, the correlations are much lower, especially with respect to level stress. This supports the assumption that perceived intensity is a potential independent factor contributing to the level stress effect, and we shall therefore disregard acoustic intensity in the following.

The average values for the perceptual summations are given in Table 6, along with the results of a paired-samples t-test for each subcategory.[17]

| | *V1* | *V2* | *N* | *T-test* |
|---|---|---|---|---|
| Accent 2 medial position | 1 876 637 | 1 288 459 | 26 | p = 0,000 |
| Accent 2 final position | 1 712 323 | 1 764 326 | 18 | p = 0,733 |
| Accent 1 medial position | 1 605 604 | 1 047 796 | 11 | p = 0,005 |
| Accent 1 final position | 1 390 879 | 1 359 278 | 10 | p = 0,865 |

*Table 6: NGbr – Average perceptual summations across vowel, accent type and position*

The results seem very clear. In medial position, where we know from Figure 3 and 4 above that the duration of V2 is equivalent to or less than that of V1, there are for both accents significant differences in perceived intensity. This means that perceived intensity may

[17] The split file function in SPSS was activated before running the t-test. An interesting difference that emerges from the table and that would merit further attention is the difference in absolute values between the two accent 1

contribute to the initial syllable being heard as stressed independently of duration ratio. This supports the view that intensity is a relevant factor in stress perception.

In final position, which is where level stress is most likely to appear, we see that no significant differences emerge. The two vowels are in other words on the average equal with respect to intensity, despite the fact that V2 has significantly higher duration. This suggests that the increased duration of V2 is counterbalanced by differences in what we might call 'pure' intensity, that is, what remains when the co-variation between duration and intensity has been cancelled out.

What emerges in utterance final position is in other words a kind of level stress cum intensity, in that both vowels are perceived as equally loud. But note that this holds for accent 1 as well for accent 2. The pattern therefore cannot explain the level stress pattern, since this is limited to accent 2. This means that whatever function intensity has as in independent stress realization parameter in these dialects, it cannot account directly for the level stress pattern.

### *2.3.2 Älvdalen*

For Älvd we have less data, not only with respect to speakers, but also because words with accent 1 and short root vowels are no longer in existence in this dialect. The fact that root vowels in this type have all lengthened makes comparison across the two accents in other words impossible for Älvd. The only thing we can do is to check whether the patterns found for accent 2 in NGbr are the same in Älvd

As can be seen from Table 7 and 8 below, this is to a considerable extent the case. Table 7 shows that as in NGbr. acoustic intensity and duration are very highly correlated, while the match between duration and the perceptual summations is less perfect. Also for Älvd it is therefore the case that only a part of the perceived intensity can be accounted for by duration alone.

| | | *Acoustic intensity* | | *Perceived intensity* | |
|---|---|---|---|---|---|
| | | *R* | $R^2$ | *R* | $R^2$ |
| Accent 2 | V1 | 0,981 | 0,962 | 0,728 | 0,530 |
| | V2 | 0,953 | 0,908 | 0,767 | 0,588 |

*Table 7: Älvd – Correlations between vowel duration and intensity measures*

environments. This lies outside the scope of the present paper, however, but it should be noted that the variance is considerable around all the means, presumably due to variation with respect to speaking level.

Table 8 likewise shows that the pattern from NGbr. with respect to differences between mean perceptual summations is corroborated. It should be noted, however that there is a more marked difference between the means with respect to V2 in final position here than in NGbr, as can be seen from Table 6 above. The small number of tokens may be responsible for the fact that the difference does not reach significance, but we are not in a position to claim that for Älvd as well we find that perceived intensity is equal between V1 and V2 in final position.

| | | *V1* | *V2* | *N* | *T-test* |
|---|---|---|---|---|---|
| Accent 2 | medial position | 2 963 655 | 1 693 183 | 12 | p = 0,001 |
| Accent 2 | final position | 3 101 288 | 2 615 687 | 8 | p = 0,229 |

*Table 8: Älvd – Average perceptual summations across vowel and position*

We can therefore conclude that although they are less clear, the Älvd results do not contradict those from NGbr. The conclusion reached at the end of the discussion of NGbr above that perceived intensity cannot be a factor contributing to the level stress effect is in other words supported, although weakly in the absence of comparable accent 1 data.

### 2.4 Vowel quality

As mentioned above, non-low short and long vowels in Norwegian and Swedish differ not only in duration but also in quality. The distinction is often referred to as tenseness vs. laxness and it is usually described as long vowels being articulated with more muscular effort. As a result of the reduced muscular effort, short vowels are somewhat lower and more centralized than the corresponding long vowels. Acoustically this would manifest itself as higher F1 and for front vowels lower F2 and for back vowels higher F2 (Ladefoged and Maddieson 1996: 302ff).

Since long vowels only occur in stressed syllables in North Scandinavian, and tenseness is correlated with length, it is conceivable that tenseness may contribute to long vowels being perceived as stressed. If this is the case, it is at least thinkable that a possible property of V2 that could trigger the level stress effect might be tense vowel quality instead of lax. In this section we shall therefore compare F1 and F2 values of V1 and V2 in level stress words, and compare them to corresponding values of true long vowels in stressed syllables.

What makes such a comparison possible is another development which is characteristic of level stress words, called metaphony (Haugen 1976: 261f) or vowel levelling (Riad 1992: 213ff). An inspection of the level stress words listed in Table 2 and 3 reveals that in all of them V2 is rounded, and in most of them V1 and V2 are identical. Taking the Old Norse infinitive *fara* 'to travel' as an example, the present day forms in both NGbr and Älvd are [fɔ.rɔ]. The most common account of this change is that V2 at some stage rounded and next assimilated the root vowel.[18] Limitations of space do not permit a full account of these changes here, the interested reader should consult sources such as Haugen (1976) or Riad (1992). The important point is that the fact that V1 and V2 have assimilated makes possible a direct comparison of their quality, both with respect to each other and with respect to a long reference vowel. If the quality of V2 is different from that of V1 and in addition lies closer to the quality of the long vowel, this could be counted as (part of) an explanation of the level stress effect. A vowel which by durational criteria is neither short nor long and whose quality can be identified with long vowels may cause the listener to perceive it as indeterminate with respect to stress

### *2.4.1 North Gudbrandsdal*

F1 and F2 were therefore measured by means of LPC analysis of 20 ms. around the vowel midpoint. V1 and V2 of all level stress words in the database with [ɔ] as V1 and possibly V2 were measured, except those with C = nasal, since vowel nasalization may corrupt LPC readings.[19] Tokens from phrase medial as well as phrase final position were included. The words used from NGbr were /po.so/ [pɔ.sɔ], *pose* '(paper) bag'; /so.go/ [sɔ.gɔ], *sage* 'to saw' and /sto.ko/ [stɔ.kɔ], *stake* 'stick'. As reference vowel was used the long stressed vowel in [bə.ˈgoː], *begå* 'to commit (e.g. suicide)'.

As it turns out, no significant difference in quality between V1 and V2 could be detected, neither in NGbr nor in Älvd. In Figure 7, which represents the average over all tokens and

[18] The assimilation of the root vowel applied vacuously in the cases where this vowel was already non-high, back, rounded in Old Norse, viz. *koma* 'to come'.

[19] [ɔ-ɔ] is probably the most common vowel pair, being the leveling result both with respect to infinitives and so-called weak (disyllabic) masculine nouns. The third major class, weak feminines, are leveled with [~~ʉ-ʉ~~].

speakers in NGbr, we see that there is no difference between V1 and V2, and that they both show the expected difference with reference to the long vowel along the lax-tense dimension.

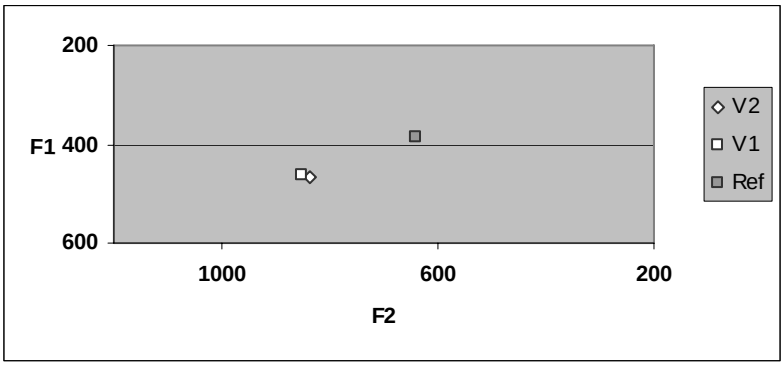



*Figure 7: NGbr – Average formant values of V1 and V2 in level stress words with [ɔ-ɔ] compared with a long reference vowel*

A one-way ANOVA with the four words as independent variable and F1 and F2 in V2 in all four words as the dependent variables confirms the results depicted in Figure 7 with respect to the difference between V2 in the level stress words and the reference vowel. Post-hoc comparisons further establish that there are no differences between the V2 measures of the three level stress words, while they were all significantly different from the reference vowel with respect to F1 as well as F2, as shown in Table 9. We see that all differences are significant at the 0.05 level.

| | | |
|---|---|---|
| [pɔ.sɔ] | F1 in V2 vs. F1 in reference vowel | p = 0,000 |
| | F2 in V2 vs. F2 in reference vowel | p = 0,000 |
| [stɔ.kɔ] | F1 in V2 vs. F1 in reference vowel | p = 0,003 |
| | F2 in V2 vs. F2 in reference vowel | p = 0,006 |
| [sɔ.gɔ] | F1 in V2 vs. F1 in reference vowel | p = 0,044 |
| | F2 in V2 vs. F2 in reference vowel | p = 0,003 |

*Table 9: NGbr – Results of statistical testing of F1 and F2 differences between V2 of level stress words and a long reference vowel*

### *2.4.2 Älvdalen*

In the Älvd database there are four words with vowel levelling in [ɔ-ɔ]: [drɔ.ɣɔ], *dra* ‘to pull’, [fɔ.rɔ], *fara* ‘to go’, [skɔ.kɔ], *skaka* ‘to shake’ and [tɔ.ɣɔ], *taga* ‘to take’. As each word is represented thrice in the database, there are 12 tokens per speaker. Unfortunately there are no words in the database that can provide a long reference vowel, so in this case we must limit ourselves to compare the qualities of V1 and V2. Since the speakers are a male (EW) and a female (GW), the results are given for each of them separately. The plots in Figure 8 represent the averages over all 12 tokens. We see that the results are very similar to those found for NGbr, as there is virtually no difference between V1 and V2 for neither of the speakers. A one-way ANOVA with words as the independent factor and formant values as dependent factors renders no significant differences.

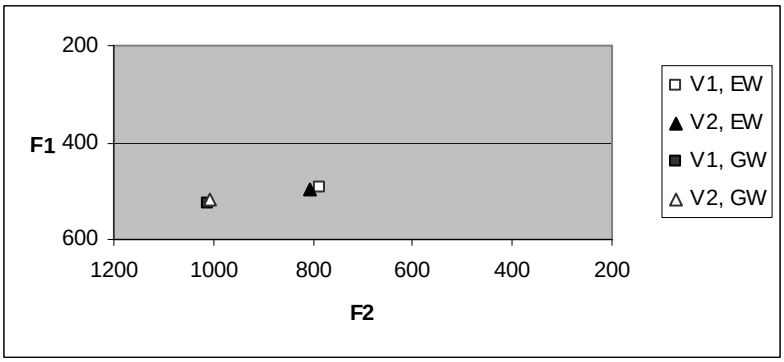



*Figure 8: Älvd – Average formant values of V1 and V2 in level stress words with [ɔ-ɔ]*

### *2.4.3 Conclusion*

The analyses in this section has shown that V1 and V2 in level stress word with metaphony in [ɔ-ɔ] are not different with respect to vowel quality, and further, that V2 in NGbr is different in quality from the corresponding long vowel. This shows that the quality of V2 cannot be (part of) the reason why it is perceived as more stressed than V2 in words with heavy and fully stressed V1.

## 2.5 Tonal accent

After having reviewed syllable weight as manifested through duration and intensity as well as vowel quality as possible phonetic cues to level stress, we can conclude that neither of these can account satisfactorily for the level stress effect alone. This should come as no surprise, given the fact that level stress as noted at several points already only emerges in connection

with accent 2. There must in other words be some property connected with the realization of accent 2, combined with the fact that the two syllables have equal quantity, that causes the level stress effect.

North-Scandinavian tonal accent is different from the pitch accents found in other Germanic languages such as West Germanic German, Dutch and English, as analysed in e.g. Ladd (1996). While the latter comprises several different melodies, or tunes, each conveying an intonational meaning, Norwegian and Swedish tonal accents are in principle limited to two contrastive melodies, which are primarily used to differentiate meaning at the word level, either by lexical marking or by being part of the exponence of different morphological categories.[20] The contrast is only found in polysyllabic words. Monosyllabic words have consistently accent 1.

At the same time, the Scandinavian tonal accents bear a strong resemblance to the pitch accents in the West Germanic languages in that the melodies are aligned with stressed syllables and in that they contribute to marking the constituents with which they are aligned as prominent with respect to discourse and grammar. Thus we find deaccenting of constituents that are part of already activated background information (Fretheim and Nilsen 1991; Nilsen 1989), and tonal accent is used to mark the head of compounds, in that the primarily stressed constituent alone can bear tonal accent, while the others are deaccented. In the latter function it is parallel with the difference in pitch accent assignment in English distinguishing between compounds and phrases (Gussenhoven 2004: 19).

In both West-Germanic and North-Scandinavian fundamental frequency therefore signals the presence of stressed syllables. But since pitch accents are part of the intonational system in West-Germanic, they must be regarded as phonetic *cues* to stress (Ladd 1996: 50) and not an intrinsic property of the syllables that they align with. This implies in other words that stress is a property that is assigned to a given syllable independently of pitch accents and intonation. When a given intonation contour then is assigned to a sentence, the pitch accents that make up the contour along with boundary tones will align with some of the stressed syllables in the sentence, and provide these with strong tonal cues to their status as stressed syllables.

For North-Scandinavian, the picture is somewhat more complex. Since realization of the tonal accents is dependent on intonation, we might say that intonation in addition to providing

---

[20] There is a considerable literature on Scandinavian tonal accents, see e.g. the references cited in Kristoffersen (2000: chapter 9) and (2006).

cues to stress alone also provides the cues necessary for the tonal accent distinction to manifest itself. The tonal accents are in other words part of the input, just like stress itself, but are dependent on intonational prominence in order to be realized. On such a view, one might say that intonational pitch accents in North Scandinavian are tonally underspecified units which are filled with tonal substance only when associated with syllables specified for stress as well as tonal accent. Still another way of saying this is that intonational assignment of pitch accent licences linking of the tones making up the accent associated with a given word with the relevant tone bearing units (tbu) of the prosodic phrase that corresponds to that word.[21]

In most Swedish and Norwegian dialects, all stressed syllables must be heavy. The level stress dialects are special in this respect. Also here, stress is signalled by syllable weight, in that CVV and CVC syllables are stressed, the former invariably so. But in contrast with the majority system, stress may also be assigned to light syllables, and there is no mechanism such as mora insertion that may force vowel lengthening or consonant germination in order to make the syllable more "stressfähig". The tonal accents associated with these words will nonetheless be licensed and linked if the stressed syllable is assigned a pitch accent by the intonation. Given the fact that the stressed syllable is light, and therefore durationally shorter, these will have to be accommodated within a temporally more confined domain than is the fact with domains where the stressed syllable is heavy. A natural place to start is therefore to take a closer look at how the accentual melodies are synchronized with the strings of syllables to which they are anchored.

Note that the above analysis presupposes that a general stress assignment algorithm assigns stress to the initial root syllable in level stress words as well as in words with heavy root syllable, presumably by building a moraic trochee at the right edge of the word (Kristoffersen 2000: chapter 6). The strongest arguments in favour of this line of reasoning are that without stress being assigned to the root syllable, tonal accent assignment will be disrupted. As will be shown below, this is not the case. The tonal accent is anchored to the root syllable in both cases. From this it follows ex hypothesi that the level stress effect must be perceptually conditioned and not a result of deviant footing and stress assignment by the production grammar. Perception may of course cause the grammar to change, as proved by those dialects where level stress has developed into final stress. But the perspective of this

[21] In fact, the minimal degree of lexical specification of tone is very sparse. In Kristoffersen (2006) it is shown that the accentual contrast can be derived by providing polysyllabic accent 1 words with a lexically linked L(ow) tone. All other tones can then be filled in by intonation in a completely regular and predictable fashion.

article is that until such a change has been completed, level stress words are footed by the grammar such that metrical prominence is assigned to the initial syllable. The germ of change then must be sought in perception, where two analyses may be assigned to the same structure.

For each dialect we shall start with the phonetic realization of the tonal accent contrast across light as well as heavy stressed syllables. The ultimate goal is to show how the tonal melody of accent 2, but not accent 1, when combined with a light, stressed syllable, can give rise to the following syllable being perceived as stressed without the underlying stressed syllable loosing all of its stress-signalling properties.

With respect to phonetic realization, both Älvd and NGbr belong to the central dialect group where accent 2 is realized with two peaks separated by a low tone, the first linked to the stressed syllable and the second realized later in the word (Gårding 1977). The two dialects differ in that the final H is part of the accentual melody proper in Älvd where it is normally followed by a low boundary tone. In NGbr on the other hand the second H is best interpreted as a right edge boundary tone. Älvd thereby belongs to the same group as Stockholm Swedish with respect to accent 2 (Bruce 1977), while NGbr represents the East Norwegian type as described and analyzed in Kristoffersen (2000; 2006; 2006; 2007). Also with respect to accent 1, NGbr represents the common East Norwegian type with a low tone on the stressed syllable followed by the same boundary H as in accent 2. Älvd, however, is different from Stockholm with respect to accent 1. Where the latter has a low tone associated with the stressed syllable, as in East Norwegian, Älvd signals accent 1 by a high tone on the stressed syllable, followed by a low tone, presumably the same boundary tone as found finally in accent 2. What is common to both dialects and crucial for the topic of this paper, is that what we may call the "tail" of accent 2 is identical with the accent 1 melody.[22]

### *2.5.1 North Gudbrandsdal*

As mentioned above, the accentual melodies are HLH for accent 2 and LH for accent 1 in NGbr, where the initial tone is linked to the stressed syllable. The L of accent 2 is realized on the post stress syllable, while the final H in both accents is realized on the final syllable of the accentual domain. However, the complete accent 1 melody in NGbr should also be analyzed as an HLH melody, with the initial H associated with a syllable immediately preceding the stressed one in cases where such a syllable is available (Kristoffersen 2007). The result of this can be seen in the following examples as an initial fall in accent 1 words.

Figure 9 shows a representative pair of contrasts, depicting words with heavy root syllable (CVC.CV, left panel) and light root syllable (CV.CV, right panel).[23] We see that the contrast is realized in the same way irrespective of the weight of the root syllable. We also see that in the level stress word, i.e. the black contour in the right panel, a greater portion of the contour is realized in the final vowel.

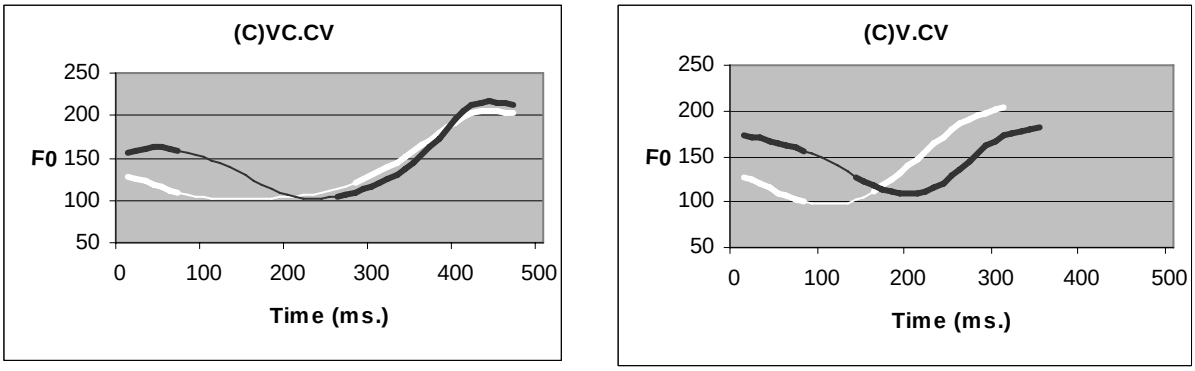



*Figure 9: NGbr – Accentual melodies across words with heavy and light stressed syllable in utterance final position. Black contour = accent 2. Thick line = vowel.*

I Kristoffersen (2006) the tonal accent contrast in polysyllabic words is analyzed phonologically as a contrast between an inert, lexically linked low tone (accent 1) and a free L in other environments which in polysyllabic words is relegated to the post-stress syllable due to the insertion of an H on the stressed syllable driven by markedness considerations. The contrast is thereby conceptualized as a difference in timing of the low tone. In accent 1 it is synchronized with the stressed syllable, while in accent 2 it is postponed to the post-stress syllable due to the high tone on the stressed syllable.

Applying this perspective to the data in Figure 9, we see that the relative delay is greater in the level stress word than in the word with heavy stressed syllable. In the latter, the L coincides with the onset of the second syllable, while in the former the L is fully contained within the vowel of the same syllable.

---

[22] This was first observed by Einar Haugen, see e.g. Haugen and Joos (1952) and Haugen (1967)

[23] The words, spoken by TH in utterance final position, are (CVC:CV) /[1]føn.ne/, *fonna* 'the snow fen', /[2]pɛn.na/, *panna* 'the forehead', and (CV:CV) /[1]ʂe.nə/, *skinet* 'the shine' and /[2]ʂe.ne/, *skine* 'the shine (dative)'. The contours have been extracted by means of the Praat software, where they have been subjected to the smoothing function before being further processed in Excel.

At the outset, this can be viewed as an indirect effect of compression due to the fact that the three tonal targets must be realized within a more confined temporal span. This problem can be alleviated in at least two ways, by augmenting the duration of the individual segments, or by undershooting the tones. We have already seen above in section 2.2 on duration that the former option is not exploited to a significant degree. Figure 1 - 4 above show that we find a small difference between accent 1 and 2 with respect to the final vowel in utterance final position in words with light root syllable, but not between accent 2 words with heavy and light root syllable.

We find, however, a consistent undershoot with respect to the low tone in level stress words compared to accent 2 words with heavy root syllable.[24] As can be seen from Figure 10, there is a 16 Hz. difference between the two groups. At the same time, there is a smaller difference with respect to the initial H, so that the average fall is reduced from 65 Hz. in words with heavy stressed syllable to 38 Hz. in level stress words.

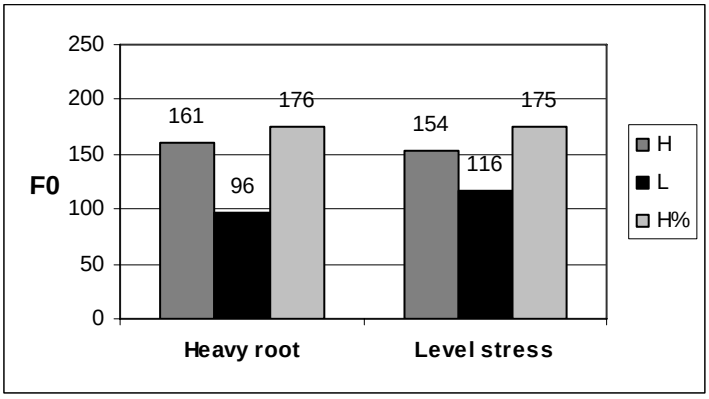



*Figure 10: NGbr – Average F0-value of each tone in accent 2 in utterance final position.*

But even if this makes it easier to accommodate the three tones within the shorter, level stress span, the delay of the L with respect to the syllable structure in level stress words remains a striking difference between the two types in Figure 9. Since there is no a priori reason to believe that the reduced HL fall may influence the perception of stress and stress placement, we shall concentrate on the timing of the L in the following. The observant reader will already have noticed that the tonal contour through the final vowel in level stress words is identical to

[24] In order to avoid using the term 'stress' in a possibly confusing way, I shall in the following refer to the initial syllable of the disyllabic domains under discussion as the root syllable, in accordance with the traditional terminology used in diachronic studies.

a full accent 1 contour. It is in other words possible that the final syllable of level stress words can be perceived as an independent accentual domain, and thereby as an independent stress domain. At the same time, the full disyllabic domain also has the tonal property of an independent stress domain.

Note that also with respect to words with heavy root syllable the final syllable in accent 2 words manifests the LH rise characteristic of accent 1. But in this case, the fact that the initial syllable is heavy may cause it to be heard as the unequivocally stressed syllable within the disyllabic domain. In the absence of this difference in quantity, however, and with the full LH contour, including the initial fall being played out within the bounds of the final vowel, the tonal signals may heard as ambiguous in the sense that it is possible to assign two different analyses to the same structure. One is an accent 2 contour across the two syllables, and therefore stress on the initial root syllable. The other is a pre-stress H on the first syllable, followed by a final, stressed syllable with accent 1, reinforced by the fact that the complete part of the curve representing the underlying L is confined within the final vowel, fully parallel to what we find in clear cases of monosyllabic accent 1, where the LH-contour also must be confined within one syllable. The cause of the level stress effect on this view is in other words an ambiguous tonal signal combined with the absence of syllable weight as the deciding factor for stress placement. On this account, level stress is not a matter of stress sharing between the two syllables, but one of an inherent perceptual ambiguity between two interpretations. Both syllables lack the property that would have identified them as stressed, viz. bi-moraicity, while both have tonal properties that associate them with stress.

Lengthening of the final vowel may in such a situation reinforce the propensity to assign an independent accent 1 contour and thereby stress to the final syllable. In fact, several dialectologists, such as Storm (1884: 62 f.), Horne (1917: 9) and Ekre (1960: 9) have noted that lengthening of the final vowel increases stress on the final syllable.[25] But the ambiguity will remain only as long as the final vowel is realized as a lengthened *short* vowel. The moment lengthening brings it into the lower bounds of a long vowel the hypothesis predicts that the word will be interpreted with unambiguous final stress. This is exactly what has happened in the two dialects known to have developed final stress, Tinn in Norway (Skulerud 1922: XX) and East Mora in Sweden (Levander 1925: XX).

A weakness of this hypothesis as it has been developed so far is that it has been developed from inspection of one single realization of each category, as represented in Figure 9.

[25] For the relevant citations (in Norwegian), see Kristoffersen (2007: 1).

Although I have claimed that these are representative in a way that is relevant to the topic of this paper, this remains to be shown. In order to establish the hypothesis on a more solid footing, we need to test it against a broader and representative set of data to see whether it is corroborated.

Since we have already established the quantity facts in section 2.2 above, we now need to test whether there is a significant difference between accent 2 words with heavy and light root syllable with respect to L-timing. To the extent that we can show that L to a greater degree is confined within the final vowel in level stress words than in words with heavy root syllable, we have established evidence in favour of the hypothesis that the final syllable will be more prone to be interpreted as an independent accent 1 domain instead of as the unstressed syllable of a disyllabic accent 2 domain. At the same time, it is important to point out that since level stress is a perceptually based concept, it is in principle impossible to measure it directly in the acoustic signal. What we *can* do is to establish parameters and relationships which may be used as building blocks for hypotheses that ultimately can be subjected to perception tests.

To say, as I just did, that a tone to a greater or lesser degree is confined within a vowel will perhaps strike some as a somewhat unorthodox way of describing the relationship between a tone and its tone bearing unit, even if we are dealing with phonetic realization and not phonological structure. The basic question, however, is how we can measure the temporal relationship between a tone and the tone bearing unit in the prosodic structure with which the tone is associated. While vowels (and syllables) have extension in time, tonal peaks or troughs are usually seen as basically points in time, which can be related to some point, such as the mid point, or phase, such as the latter half, within the time span of the vowels with which they are associated.

This perspective presupposes that it is possible to identify the turning point where e.g. a falling HL turns into a rising LH and relate this to some point relative to the vowel, defined for instance by distance in ms. from the vowel onset. But exact identification of such turning points in F0 scores in recordings not made under optimal conditions may often be problematic. Microprosodic variation due to different kinds of noise in the signal may introduce distortions. In addition, we often find a series of measuring points with almost the same value, also in shorter words such as level stress words, which makes the identification of an exact turning point to a certain extent arbitrary.

If we take this fact as a starting point, that is, the fact that the lowest phase of a trajectory representing an underlying L tone may be distributed in time, an alternative approach presents itself. It is well known that tones may spread and associate to a string of consecutive tone

bearing units, forming so-called plateaus. Consequently, tones *can* have extension in time, which in principle can be measured. In East Norwegian, the L-tone of the two accentual melodies is in fact what we may term an emergent plateau tone. In longer domains, such as compounds, the initial H in accent 2 will associate with the stressed syllable of the initial member of the word, and the final H will associate with the final syllable. The L will associate with all the intervening syllables (Kristoffersen 2000: 247ff). (In accent 1 the initial L will associate to the stressed syllable and all subsequent non-final syllables in the same way.) As shown in Figure 11, which depicts the tonal contours of three accent 2 words of different length as spoken by the same speaker, this is also the case in NGbr.[26]

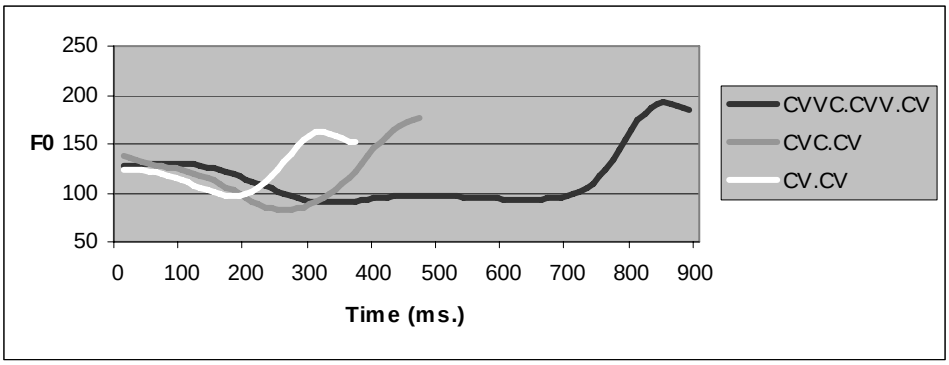



*Figure 11: NGbr – Accent 2 words of different length showing corresponding degrees of L-spreading*

It is therefore in principle possible to define the L also of a minimal, disyllabic CVCV domain as a minimal plateau. To the extent that it is possible to measure this plateau as an extension in time, this measure can then be related in a precise and non-arbitrary way to the segmental and syllabic structure of a given word. This means that we can compare the length and timing of this plateau with respect to accent type as well as differences in syllable weight.

At the outset, measuring the L as an extension in time is fraught with the same difficulties as those connected with measuring the L as an exact point in time. But once we realize that what we need is a consistent *relative* measure rather than an exact measure, it is possible to overcome these difficulties, at least to an extent where we may be able to learn something substantial about the synchronization of tones and syllables in level stress words compared to other prosodic types. The following method of measurement was therefore adopted:

---

[26] The words are /ˈstein.hɑː.rə/, *steinharde* 'rock hard' (pl.), /ˈpen.na/, *panna* 'the forehead' and /ˈʂe.ne/ *skinnet* 'the shine' (dative) in utterance final position by AD.

In the smoothed F0 contours of both accent 1 and accent 2, the value of the lowest measuring point was identified. 8 % was then added, such that if the lowest value of the F0 contour was for example 100 Hz. the result of adding 8 % would be 108 Hz.[27] If we refer to this lowest Hz.-value plus 8 % as the L-ceiling, the L-phase can be identified as the span between the two points where the contour crosses the L-ceiling value, on its way down and on its way up. These points I shall refer to as L-init and L-fin in the following.

The result of this procedure is depicted in Figure 12, which shows the contour of an accent 2 word with long vowel at the beginning and end of the L-phase.[28] The horizontal line represents the L-ceiling, and the two crossing points L-init and L-fin.

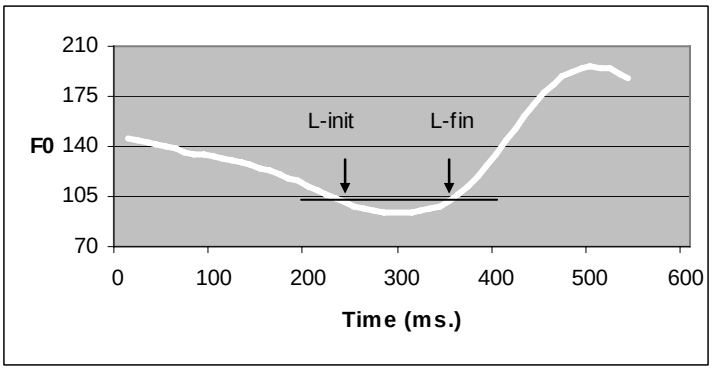



*Figure 12: NGbr – Measurement of the L-phase of an accent 2 contour*

The distance between L-init and L-fin can be measured in milliseconds, and be related to fixed points in the segment string. I have chosen to relate the L-phase with the durational span of the segmental string by means of a percentage scale where the V1 onset is 0 % and the V2 onset 100 %. For any given token, both L-init and L-fin can then be related to the segmental string by means of two percentage values. This means that for any L-init or L-fin, a measure below 100 % means that it located before the V2 onset, while measures above 100 % means that it is located within V2.

Note again that this procedure does not imply precise claims about any 'real' extension of the L-tones. It has been developed in order to make possible a comparison between the relevant subgroups of the relative timing of the accentual contours with respect to the

[27] The 8 % value is in principle an arbitrary value, but was chosen partly as a result of inspection of contours with identifiable 'corners' at the beginning and end of the low phase.

[28] The word is /ˀʂiː.nə/, *skinne* 'to shine' in utterance final position as spoken by AD.

segmental string with which they are associated. At the same time, I think it may be safe to say that the distance between L-init and L-fin represents *approximations* of the realization of the underlying L-tone in real time.

Let us now start the analysis by stating two hypotheses with respect to the absolute duration of the L-phases. The first is that the L-phase will be shorter in accent 2 words than in accent 1 words, given the fact that there is an initial H in accent 2 that is absent (from the stressed syllable) in accent 1. The second is that the L-phase will be shorter in words with short root syllable than in long, since the total time span is shorter in the former. Figure 13 shows that the first hypothesis finds support in the data; the L-phase is longer in accent 1 than in accent 2, although the difference is smaller with respect to the words with short root vowel. This fact can be attributed to the fact that the second hypothesis, that the L-phase will be shorter in words with short root vowel, is corroborated only with respect to accent 1. While there is a clear difference between the two types in accent 1, the extension of the L-phase in accent 2 is close to constant irrespective of type of root vowel and thereby with respect to quantity type of the root syllable. This suggests that the L-phase is subject to a durational minimum, which in level stress word is maintained by undershooting the F0 value of the low tone, as shown in Figure 10.

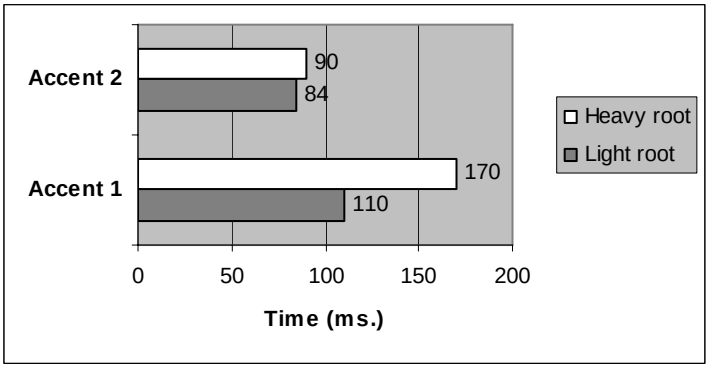



*Figure 13: NGbr – Mean absolute duration of L-phase in different word types*

We now turn to the timing between segments and the L-phase. Given the constant duration of the L-phase in accent 2 words, we will expect that at least the L-fin point will come later with respect to the onset of the final vowel in the level stress type than in words with heavy root syllable. As argued above, this may contribute to the final vowel being heard as accented. As shown in Figure 14, this is the case. The horizontal bars depict the distance between the

average L-init and L-fin with respect to the four types. The vertical bars represent the syllable boundary, i.e. the onset of C in the (C)V.CV and the (C)V:.CV words.[29]

We see that the level stress type in fact distinguishes itself on two points. First, it is the only one where the complete L-phase is realized within the second syllable, even if the heavy accent 2 type also comes close to this. But contrary to the type with heavy root syllable, the L-init in level stress words is found well after the onset of the second syllable, so that there is room as well for part of the fall from the initial H within the second syllable. Such a fall can be seen in the level stress contour shown in Figure 9, right panel. In addition, and perhaps most importantly, we see that the level stress type is the only one where L-fin, that is, the point where the F0 contour starts its upwards rise towards the final H, is found well into V2. The level stress type is in other words the only one where the complete L-phase is contained within the second syllable and where the final, upwards turning point is found within the syllable peak.

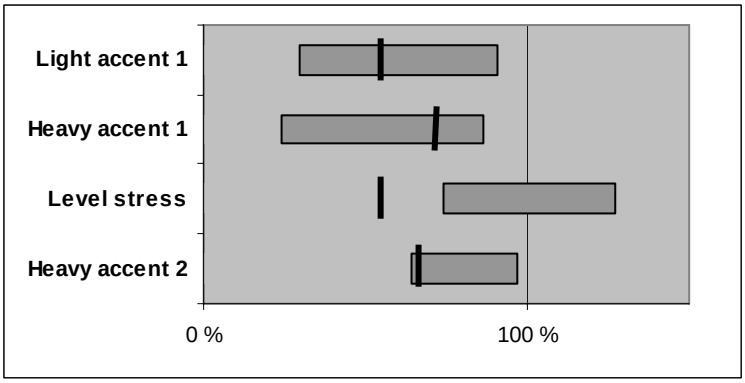



*Figure 14: NGbr – Relative timing of L-phase in utterance final position with respect to vowel onsets (0 and 100 %) and syllable onset (vertical bars)*

We have now established that NGbr accent 2 words with heavy root and level stress words can be distinguished on two points. First, the L in the HLH melody is truncated in level stress words, and second, the L-phase of level stress words occurs later with respect to the syllable structure than in words with heavy root syllable. The latter can be seen as a consequence of

[29] Note that the syllable boundary has been extracted from only a subset of the words with heavy root syllable, viz. those with long vowel, since the boundary in words with short root vowel followed by a geminate consonant falls within the geminate and therefore cannot be identified precisely.

the finding that speakers seem to respect a minimal duration requirement with respect to the L-phase, since this is not truncated in level stress words compared to words with heavy root.

These results hold up when tested for statistical significance. The test was made by means of a one way ANOVA on a balanced sample consisting of 24 accent 2 words with heavy root syllable and 24 level stress words. Heavy vs. light root syllable represented the dependent variable, while the three independent variables were lowest F0 measure in Hz., absolute duration in ms. of the L-phase, and relative timing with respect to V1 onset of L-init and L-fin.[30] The ANOVA fully supports the results obtained, as shown in Table 10, where the differences with respect to truncation and timing are all significant at the $p < 0,05$ level, while no significant difference with respect to absolute duration was found..

| | |
|---|---|
| Truncation of L in level stress words | p = 0,001 |
| Timing of L-init | p = 0,019 |
| Timing of L-fin | p = 0,000 |
| Absolute duration of L-phase | p = 0,681 |

*Table 10: NGbr – Results of ANOVA testing differences with respect to tonal timing and truncation*

These results support the hypothesis stated above that the level stress effect is a result of the low tone coinciding with the final syllable in a way that invites the listener to interpret it as an accented, accent 1 syllable in its own right. The statistical significant differences represented in Figure 14 in other words support the hypothesis that the resemblance between the accent 1 contour and the final part of the accent 2 level stress contour is not coincidental, but representative of a significant relationship between the final vowel of level stress words and accent 1 on the one hand and the whole disyllabic level stress complex and heavy accent 2 on the other. Examples of the three contour types are given in Figure 15 as illustration of this point. The resemblance between heavy accent 2 and level stress is easy to see, as is the resemblance between the final, vocalic part of the level stress contour and the complete accent 1 contour.

But even if the second syllable of level stress words meets the tonal requirements of a prototypical accent 1 phrase, the final vowel is not long enough to be perceived as fully

[30] The sample consisted of 3 * 8 words with heavy root (*panna,* 'the forehead'; *pina,* 'the pain' and *skine,* 'to shine') and 3 * 8 level stress words (*senu,* 'sinew'*; kåmå* 'to come' and *spånå,* 'wooden shingle'.

stressed compared to the initial vowel. Since the two syllables making up a level stress words at the same time meets the tonal requirements of a prototypical accent 2 phrase, without the second vowel being long and therefore unequivocally stressed, the listener is left with an ambiguous signal with respect to which of the two syllables is the accented and strong one with respect to the other.

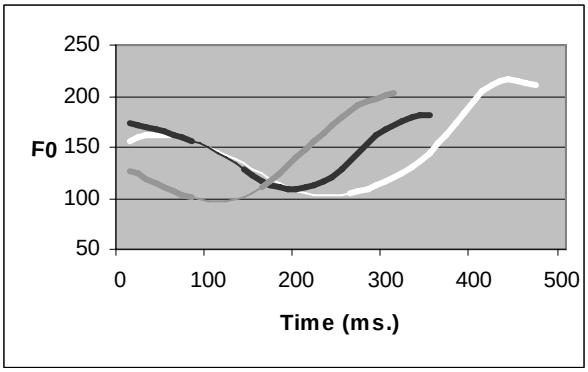



*Figure 15: NGbr – Comparison of level stress (black), heavy accent 2 (white) and light, disyllabic accent 1 (grey)*

Figure 16 illustrates this point by comparing a level stress word with a disyllabic word with final stress, phonological long vowel and accent 1 in utterance final position.[31] We see that the only difference between the two contours in addition to the expected L-truncation in the level stress word is in the duration of the final vowels. The final vowel in the level stress word is phonologically short (154 ms.), while the final vowel in the word with final stress is phonologically long (264 ms.).

[31] The two words are /be.go:/, *begå* 'to commit' and /so.go/, *sage* 'to saw' as spoken by TH. Due to microprosodic perturbations caused by the intervocalic, voiced stop, part of the intervocalic contour of the level stress word has been interpolated.

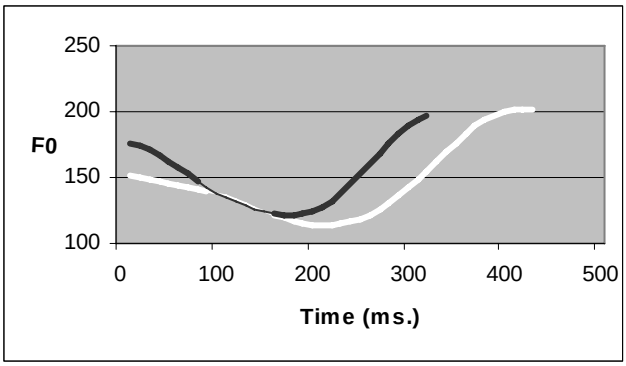



*Figure 16: NGbr – Comparison of a level stress word (black line) with a word with full stress on the final syllable (white line)*

At this point it could be tempting to conclude that the absence of a bimoraic syllable in a level stress words that (in combination with the accent 2 melody) is the deciding factor. But this cannot be the full truth, because NGbr allows monomoraic CVC and marginally CV stress feet in monosyllabic domains. If such feet are well-formed as monosyllabic words, they should also be well formed as a full stress foot finally in longer words. This would imply full stress on the final syllable, not level stress.

The most common is the CVC-type, consisting of a contrastively short vowel plus a contrastively short consonant.[32] This type has survived from Old Norse, and constitutes a separate stressable minimal syllable type in addition to CVː and CVCː. An example of this three-way contrast is CVC /las/, *las* 'read (pret.)', vs. CVː /laː/, *la* 'laid (pret.), vs. CVCː /lasː/, *lass* 'a load'. The two CVC types are distinguished both with respect to duration of the final consonant, as documented in Kristoffersen (1990),[33] as well as in their phonological behaviour when a vowel initial suffix is added to a stem belonging to one of these two types. The final C in CVC stems in such cases resyllabifies, rendering a CV.CV structure with light root syllable, and level stress if the suffix induces accent 2. The final C in CVCː stems on the

[32] The CV-type is on the other hand a post Old Norse innovation, which arose from later apocope of a final /ð/ in CVð words, without compensatory lengthening of the vowel. It is rarely mentioned in the literature, and only in passing (see e.g. Skogstad (1974: XX (rett forfatter??)) , and the absence of lengthening does not seem to be consistent.

[33] The difference in mean duration in utterance final position between the eight CVC-tokens in the database (/ʂen/, *skin* 'shine') and the eight CVCː-tokens (/ʂinː/, *skinn* 'skin') is significant at the 0,05 level (p = 0,0002) by a two-tailed t-test.

other hand geminates, rendering a CVC.CV structure with heavy root syllable. Translated into a weight difference, this means that a CVC syllable is monomoraic, while CVC: syllables are bimoraic. An alternative way of representing this difference would therefore be CV<C> vs. CVC, with the final C in the former being counted as extrametrical.

The fact that a monomoraic CV<C> syllable may constitute a well-formed monosyllabic word, and therefore by implication a well-formed stressed syllable, should logically imply that an accented final monomoraic CV syllable of a level stress word may constitute a well-formed stressed and accented syllable. The fact that monomoraic content words with CV-structure is marginally possible in the dialect, would seem to reinforce this argument.

But since there *was* a difference in Old Norse between CV<C> and CV in that only the former was allowed as a minimal content word, the final consonant must in some way have contributed weight to the syllable and thereby distinguished it from a subminimal, bare CV syllable. And even if this distinction has been blurred in modern NGbr by the introduction of the CV type by /ð/-truncation, there is still a distinctive difference between the two types. The CV<C> type is still common and seemingly unmarked, while the CV-type is marginal.

But once we conclude that CV<C> represents a fully stressable type, and CV not, we would by implication expect accent 2 words with the structure CV.CV<C> to have final stress instead of level stress. Examples of such words are /so.mor/, *sommer* 'summer', and /go.mol/, *gammel* 'old'. However, no source that I have consulted describes words of this type as anything but level stress instantiations. This means that only full bi-moraicity in one of the syllables is able to cancel the level stress effect, and that the CV<C> type, despite the fact that it can constitute a common monosyllabic content word on its own, is subminimal in this respect.[34]

On way to solve this apparent puzzle is to assume that the requirement of a bimoraic syllable for full stress resolution is an effect of what has been termed "the emergence of the unmarked" within Optimality Theory (REFERANSE: McCarthy 2002??). Even if a CV<C> syllable may constitute a monosyllabic word on its own, it is all the same revealed as subminimal when it comes to resolving the competition for head status between the two syllables in a level stress word. For this purpose, only the unmarked, bimoraic heavy syllable will do.

---

[34] The test case would be words with light root syllable and a truly heavy final syllable. To the best of my knowledge, stems of this type do not exist. Compounds with this structure tend to have final stress in the dialect.

### *2.5.2 Älvdalen*

We shall now see to what extent our analysis of the NGbr data can be extended to Älvdalen level stress. Figure 17 shows a representative pair of accentual melodies across word with heavy root syllable as pronounced in utterance final position by the male speaker.[35]

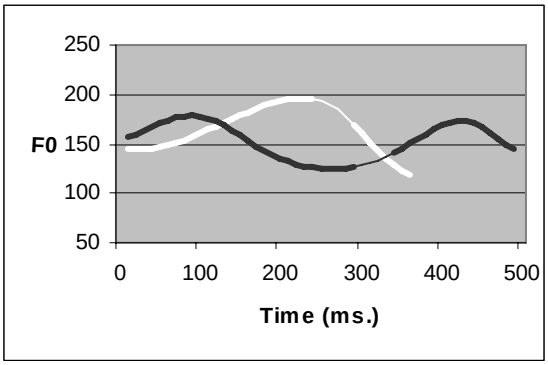



*Figure 17: Älvd – Accentual melodies across (C)V:CV words. White contour = accent 1, black contour = accent 2. Thick line = vowel.*

We see that accent 2 also in Älvd is the more complex melody, consisting of a HL fall from the stressed syllable, followed by another fall from the second syllable. The full contour can therefore be analyzed as HLH, with an H associated with each syllable. In addition we must include a final L% boundary tone, so that the full melody is HLHL. We also see that the peak in the stressed syllable comes relatively early in accent 2, and that the second peak is aligned with the centre or the second syllable. The main difference compared with the NGbr melody is the final L%, which is lacking in NGbr. The second accent 2 H in the two dialect is probably the same seen from a diachronic perspective, and in both dialects it is exploited for focus marking. But while it has developed into a right edge boundary tone in NGbr, as in East Norwegian in general, it belongs to the pitch accent system proper in Älvd. This makes the Älvd accent 2 melody similar to the Stockholm (and standard Swedish) accent 2 melody, as analysed in e.g. Bruce (1977) and Engstrand (1995; 1997).

The accent 1 contour on the other hand differs from NGbr and East Norwegian as well as from Stockholm and Standard Swedish. While these are all characterized by a rise towards a late H, which corresponds to the final H in the accent 2 melody, we find an early HL fall in

[35] The two words are /[2]skai.nɑ/, *skinna* 'to shine' and /[1]stʃiː.neð/, *skinnet* 'the shine'.

Älvd, peaking late in the stressed syllable, with the L located in the second syllable.[36] Whether there is an initial L as part of the two Älvd melodies as well is an open question, whose answer lies outside the scope of the present paper. What is important here is that the Älvd accent 1 melody is identical with the final part of the accent 2 melody, as in NGbr.

In Figure 18 the level stress contour has been added to the contrasting pair in Figure 17.[37] As in NGbr, we see that the level stress contour is an accent 2 contour, compressed due to the shorter duration of the stressed syllable. We also see that this leads to differences with respect to the alignment between the high tones and the syllables. While the first accent 2 HL fall takes place within the stressed syllable in the word with heavy stressed syllable, it is aligned with the onset of the second syllable in the level stress word.

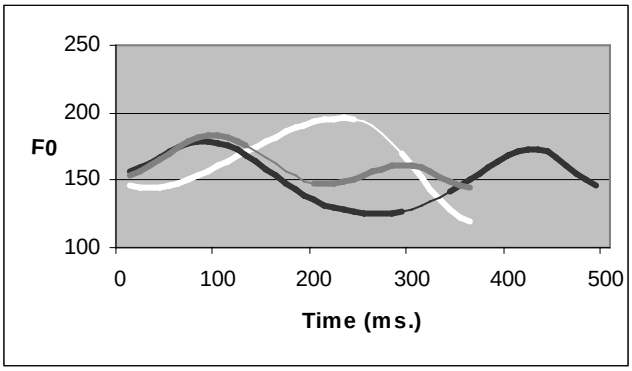



*Figure 18: Älvd – Level stress compared with accent 1 and heavy accent 2. Grey contour = level stress, black contour = heavy accent 2 and white contour = accent 1. Thick line = vowel.*

However, differences with respect to alignment seem to be of less importance in Älvd than in NGbr. The important parallel between the two dialects appears to be that the final syllable of the accent 2 word has the same tonal contour as an independent accent 1 contour. While this only holds fully in level stress words in NGbr, it appears to be a general feature of the Älvd dialect. And as can easily be seen from Figure 18, this does not only hold for the final syllable. In fact, both the initial and final syllable alone describes a prototypical accent 1 contour. This means that in Älvd, to an even greater degree than in NGbr, the stressed syllable in accent 2 words cannot be securely identified when a weight difference is absent. On the

[36] Another interesting feature is the marked difference in total duration between accent 1 and accent 2. An account of this difference lies outside the scope of the present paper, but a plausible hypothesis would be that this is related to the difference between the two melodies with respect to tonal complexity.

tonal criteria alone, both syllables in level stress words are equally strong candidates for the head position.

For Älvd one may therefore question whether the signal is ambiguous between a disyllabic accent 2 percept and a final, monosyllabic accent 1 percept, which I claimed was the case for NGbr. An alternative interpretation is that level stress in Älvd is constituted by an unambiguous pair of subminimal accent 1 feet. By ear, the Älvd level stress prosody presents itself as a much more clearly "balanced" structure than does the NGbr one. While the latter sounds truly ambiguous, Älvd in fact sounds like two equally prominent syllables. This difference can be ascribed to the differences in tonal structure. The ambiguity in NGbr can be ascribed to the fact that the initial syllable does not qualify as a separate domain by tonal criteria. This is on the other hand the case in Älvd, where the two identical accent 1 contours make it harder to perceive the underlying accent 2 structure across both syllables.

This means that also in Älvd bi-moraicity must be the unmarked way of signalling stress. In cases where this requirement is not met and the job of signalling metrical strength is left tonal features alone, stress perception as a strong/weak relation across disyllabic domains such as a level stress stem breaks down, and the domain is instead parsed as a string of two subminimal accentual domains of equal standing.

A hypothesis that follows from this analysis is that also when two heavy syllables are combined into an accent 2 domain, the two constituents will be perceived as two separate, accentual units. Such combinations are not allowed in roots, but compounds of this type are common. One example from the database is /$^{2}$stiɛ.ræːs/, *stenrøs* 'scree'. Figure 19 shows the tonal contour of the word, as spoken by the female speaker.

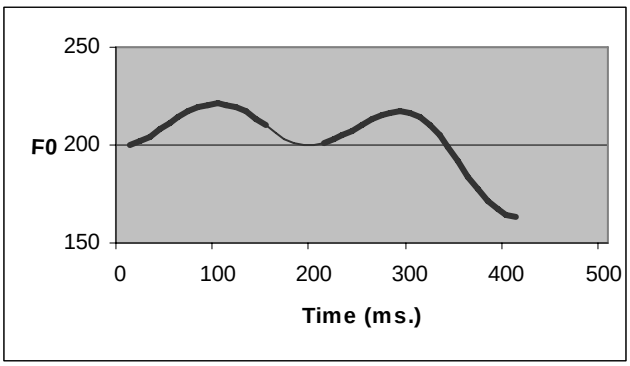



*Figure 19: Älvd – Tonal contour of accent 2 compound consisting of two heavy syllables*

---

[37] The level stress word is /$^{2}$ku.mo/, *komma* 'to come'.

Again we recognize the double accent 1 pattern, and again the pronunciation in my ears sounds like a string of two equally prominent syllables.

The claim that level stress in Älvd is the effect of combining two equally accented syllables which are also equal with respect to weight entails that a level stress word irrespective of syllable weight should sound precisely the same as a string of two separate monosyllabic words with accent 1. This hypothesis cannot be tested on level stress words however, because contrary to NGbr, there are no mono-moraic monosyllabic content words preserved in Älvd.[38] But a comparison between e.g. adjective + noun phrases and corresponding compounds is clearly possible. In Älvd we would expect these to come out as homophonous if the compound is of the accent 2 type. The parallel in English would be the well known minimal pair *blackboard* vs. *black board,* where the difference is precisely the same as in the hypothetical Älvdalen pair with respect to morhposyntactic structure, and where the difference is one between one compound accent (*blackboard*) and two independent accents (*black board*). The same contrast characterizes most, if not all, other North Scandinavian dialects, where compounds have one accent while syntactic phrases (may) have two, depending on intonational structure.

HVA SIER GUNNAR?

A further question that arises is if we find this property in other dialects, i.e. where accent 2 compounds consisting of two syllables of equal weight cannot be distinguished from at doubly accented phrase with the same structure. Do we in other words find other dialects where accent 2 has two peaks aligned with the two syllables in a disyllabic domain in the same way as the single peak of the accent 1 melody. The Standard (Stockholm) Swedish variety meets the first, but not the second requirement, that accent 1 constitutes a peak within the stressed syllable. Instead, accent 1 is characterized by a rise through the stressed syllable, with the peak located near the syllable boundary. The only other candidate is the West Norwegian Stavanger variety, whose accent 2 melody is very much like the one found in Älvd and where the accent 1 melody consists of one peak aligned with the stressed syllable (Hognestad 2006).

---

[38] Gunnar Nyström (p.c.) informs me that the CV<C> type can still be found in some subdialects of Älvd. But since a CV<C>##CV<V> phrase would not be equal to a CV.CV<C> level stress word, a perfect test is still not possible.

SJEKK MED JAN, DET FINNES IKKE EKSEMPLER AV DENNE TYPEN I TONELAGSBASEN

### 2.6 Conclusion, phonetic analysis

The overall conclusion with respect to the phonetic parameters that govern the level stress effect in disyllabic domains must be that it is the result of two factors combined: The first is the absence of the durational signals of bi-moraicity, and thereby stress in any of the syllables. When this absence is combined with the accent 2 melody, the result is that the final part of this, which is identical with the accent 1 melody of the dialect, invites an interpretation of the final syllable as a separate accentual domain. In NGbr, this leads to ambiguity, in that the first syllable by this circumcision of the final syllable by itself does not meet any of the accentual criteria for being interpreted as a freestanding prosodic constituent. In Älvd on the other hand, the result is a truly balanced structure of two subminimal accent 1 domains which takes precedence over the input accent 2 interpretation. By morphological and lexical criteria, a level stress word constitutes one domain, by accentual criteria, it is perceived as two. Thus in NGbr there is a tension between conflicting prosodic criteria, while in Älvd we might say that a tension arises between morphological criteria (one root) and prosodic criteria (two feet of equal strength).

## 3 From level stress to full stress: Implementation of the quantity shift

Utgangspunkt: Første stavelse må være hode, ellers blir tilordning av tonelag feil.

## References


Beckman, Mary E., and Janet B. Pierrehumbert. 1986. Intonational structure in English and Japanese. *Phonology Yearbook* 3:255-309.

Bruce, Gösta. 1977. *Swedish Word Accents in Sentence Perspective*. Lund: CVK Gleerup.

———. 1998. *Allmän och svensk prosodi*. Vol. 16, *Praktisk lingvistik*. Lund: Institutionen för lingvistik, Lunds universitet.

Bruce, Gösta, and Ben Hermans. 1999. Word tone in Germanic languages. In *Word Prosodic Systems in the Languages in Europe*, edited by H. van der Hulst. Berlin, New York: Mouton de Gruyter.

Bye, Patrik. 1996. Scandinavian 'Level Stress' and the Theory of Prosodic Overlay. *Nordlyd (Tromsø University Working Papers on Language and Linguistics)* 24:23-62.

Ekre, Lars. 1960. *Opplysningar til stadnamn frå Midt-Jotunheimen*. Oslo: Universitetsforlaget.

Engstrand, Olle. 1995. Phonetic Interpretation of the Word Accent Contrast in Swedish. *Phonetica* 52:171--179.
———. 1997. Phonetic interpretation of the word accent contrast in Swedish: Evidence from spontaneous speech. *Phonetica* 54:61--75.
Fretheim, Thorstein, and Randi Alice Nilsen. 1991. In Defense of [±foc]. In *Escol ´90. Proceedings of the Seventh Eastern Conference on Linguistics*, edited by Y. No and M. Libucha: The Ohio State University.
Gordon, Matthew. 2002. A phonetically driven account of syllable weight. *Language* 78 (1):51-80.
———. 2004. Syllable weight. In *Phonetically Based Phonology*, edited by B. Hayes, R. Kirchner and D. Steriade. Cambridge: Cambridge University Press.
Gussenhoven, Carlos. 2004. *The Phonology of Tone and Intonation*. Cambridge: Cambridge University Press.
Gårding, Eva. 1977. *The Scandinavian word accents*. Lund: CWK Gleerup.
Haugen, Einar. 1967. On the Rules of Norwegian Tonality. *Language* 43:185--202.
———. 1976. *The Scandinavian languages: an introduction to their history*. London: Faber and Faber.
Haugen, Einar, and Martin Joos. 1952. Tone and Intonation in East Norwegian. *Acta Philologica Scandinavica* 22:41--64.
Hayes, Bruce. 1995. *Metrical Stress Theory*. Chicago: The University of Chicago Press.
Hognestad, Jan K. 2006. Tonal accents in Stavanger: From Western towards Eastern Norwegian prosody? In *Nordic Prosody IX*, edited by G. Bruce and M. Horne. Frankfurt am Main: Peter Lang.
Horne, Helga. 1917. *Aksent og kvantitet i Vaagaamaalet, Bidrag til nordisk filologi III*. Kristiania: H. Aschehoug & Co.
Kristoffersen, Gjert. 1990. East Norwegian Prosody and the Level Stress Problem. Tromsø: University of Tromsø.
———. 2000. *The Phonology of Norwegian*. Oxford: Oxford University Press.
———. 2006. Markedness in Urban East Norwegian tonal accent. *Nordic Journal of Linguistics* 29 (1):95-135.
———. 2006. Tonal melodies and tonal alignment in East Norwegian. In *Nordic Prosody IX*, edited by G. Bruce and M. Horne. Frankfurt am Main: Peter Lang.
———. 2007. Dialect variation in East Norwegian tone. In *Tones and Tunes, Vol. 1: Typological and Comparative Studies in Word and Sentence Prosody*, edited by T. Riad and C. Gussenhoven. Berlin: Mouton de Gruyter.
———. 2007. Jamvekt: Nordisk institutt, University of Bergen.
Ladd, D. Robert. 1996. *Intonational phonology*. Cambridge: Cambridge University Press.
Ladefoged, Peter, and Ian Maddieson. 1996. *The Sounds of the World's Languages*. Oxford UK, Cambridge Mass: Blackwell.
Larsen, Amund B. 1897. *Oversigt over de norske bygdemål*. Kristiania [Oslo]: H. Aschehoug & Co.
Levander, Lars. 1925. *Dalmålet. Beskrivning och historia*. Vol. I. Uppsala: Appelbergs boktryckeri aktiebolag.
Lindblom, Björn. 1978. Final lengthening in speech and music. In *Nordic Prosody*, edited by E. Gårding, G. Bruce and R. Bannert. Lund: Department of Linguistics, Lund University.
Nilsen, Randi Alice. 1989. On prosodically marked information structure in spoken Norwegian. In *University of Trondheim Working Papers in Linguistics*. Trondheim: University of Trondheim.

Nooteboom, Sieb. 1997. The Prosody of Speech: Melody and Rhythm. In *The Handbook of Phonetic Sciences*, edited by W. J. Hardcastle and J. Laver. Oxford, UK and Malden, Mass.: Blackwell.

Riad, Tomas. 1992. Structures in Germanic Prosody. Doctoral dissertation, Department of Scandinavian Languages, University of Stockholm, Stockholm.

Sandøy, Helge. 1996. *Talemål, 2nd edition*. 2nd ed. Oslo: Novus.

Skjekkeland, Martin. 1997. *Dei norske dialektane*. Kristiansand: Høyskoleforlaget.

Skogstad, Ola, ed. 1974. *Austlandsmål. Språkarv og språkbruk på indre Austlandet*. Oslo: Det Norske Samlaget.

Skulerud, Olai. 1922. *Tinnsmaalet*. Vol. I, part 1. Halle: Max Niemeyer Verlag.

Sluijter, Agaath M. C., and Vincent J. van Heuven. 1996. Spectral balance as an acoustic correlate of linguistic stress. *Journal of the Acoustic Society of America* 100 (4):2471-2485.

Storm, Johan. 1884. *Norvegia. Tidsskrift for det norske folks maal og minder*. Vol. I. Kristiania [Oslo]: Grøndahl & Søn.