

# Danish Vowels in Spontaneous Speech in Three Modern Regional Variants

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## ABSTRACT

This paper presents the preliminary results of an acoustic investigation of the vowel sounds of three regional variants of Danish in spontaneous speech. The material for elicitation represents a conceptual fusion of word lists and interviews. Six (of a total eighteen) subjects have been analysed so far. We cannot yet with any certainty establish regional differences between them, but we have clear indications that a general restructuring of the high and mid front unrounded vowels may be under way, at least for some speakers, relative to the older standard norm.

## 1. INTRODUCTION

In stressed syllables Standard Danish has 16 monophthongal vowel sounds, most of which can occur both short and long; long vowels may occur with or without *stød*. Some of these 16 different sounds are allophones but 14 create immediate surface contrasts, cf. Table 1. Add to this [ə], occurring in unstressed syllables only. Further, there are 21 falling diphthongs, ending in [j w ʌ], and as many rising diphthongs as there are [j]+vowel sequences. The monophthongs are plotted in the cardinal vowel chart, with the broad symbols conveniently ascribed to them, in figure 1. Taking morphologically conditioned phonological alternation into account, the vowel sounds are manifestations of 10 vowel phonemes: /i e ε a y ø œ u o ʊ/.

The acoustic analyses in [1] and [2] (long vowels only) serve as our frame of reference. The description in [1] is based on recordings of eight males and one female between 22 and 47 years of age when recorded in 1952. And [2] is based on recordings of ten males and nine females (adults, age not specified) recorded in 1958-59. These are the latest systematic accounts of the acoustic properties of Danish vowels. A recent acoustic investigation of the long unrounded front vowels in Standard Danish [3] indicates that the manifestation of /e:/ and, particularly, /ε:/ has changed. /ε:/ has narrowed to the point where it merges with /e:/.

Until recently almost all phonetic investigations of Danish have been based on read speech. Consequently, our knowledge of the phonetics of spontaneously spoken Danish is sparse. Furthermore, the phonetic investigations of Danish have focussed largely on Standard Danish as it is spoken in and around Copenhagen. There are of course dialectological investigations of Danish, but their focus is rarely on empirical phonetic/acoustic investigations.

The average Danish language user will recognize a number of regional variants of Danish. We will refer to these variants as 'regiolects' because 'dialect' traditionally applies to variants of Danish which typically are older and deviate much more from modern Standard Danish. Whenever speakers of different regiolects communicate they will notice, among a number of differences, that some vowels sound different. Some of

short				long			
i	liḑ	lidt	'suffered'	i:	'mi:lə	<i>mile</i>	'miles'
e	leḑ	lidt <i>adv</i>	'little'	e:	'me:lə	<i>mele</i>	'meal'
ε	leḑ	<i>let</i>	'light' adj	ε:	'mε:lə	<i>mæle</i>	'utter'
æ	bḑæʌ	<i>bær</i>	'berry'	æ:	'mæ:lə	<i>male</i>	'paint'
a	laḑ	<i>ladt</i>	'loaded'	ɑ:	'k <sup>h</sup> ɑ:bə	<i>karpe</i>	'carp'
ɑ	laḑ	<i>lak</i>	'lacquer'	y:	'sy:nə	<i>syne</i>	'inspect'
y	ḑysḑ	<i>dyst</i>	'match'	ø:	'fø:nə	<i>føne</i>	'blow dry'
ø	øḑ	<i>øst</i>	'east'	œ:	'hœ:nə	<i>høne</i>	'hen'
œ	hœn <sup>?</sup> s	<i>høns</i>	'hens'	ɔ:	'mɔ:lə	<i>måle</i>	'measure'
ɔ	ɔḑ	<i>på</i>	'on'	ʊ:	'v:lə	<i>årle</i>	'early'
œ	ɔḑ	<i>vor</i>	'our'	ʌ			
œ	ḑrœn <sup>?</sup>	<i>grøn</i>	'green'				
u	ḑu	<i>du</i>	'you'				
o	jo	<i>jo</i>	'yes'				
ɔ	p <sup>h</sup> ɔ	<i>på</i>	'on'				
ʊ	vḑ	<i>vor</i>	'our'				
ʌ	sʌ	<i>så</i>	'then'				

Table 1: Vowel sounds in broad transcription with key words.

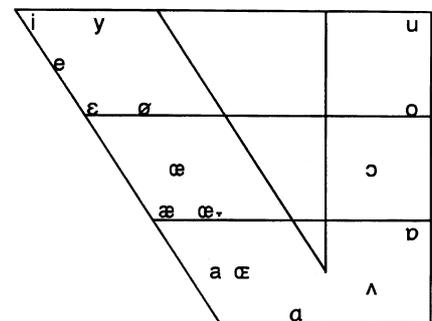


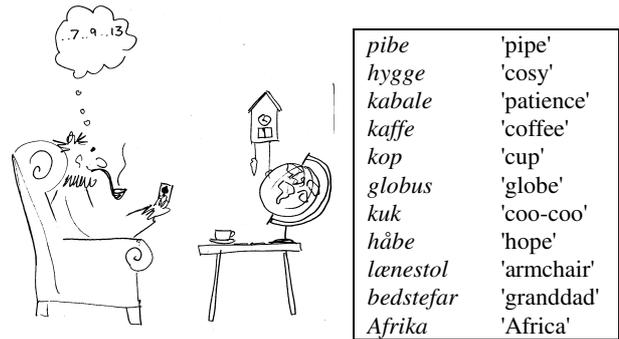
Figure 1: Danish vowel sounds with the broad symbols conveniently ascribed to them (from [4]).

these differences are lexically determined: a word like *persille* ‘parsley’ would be pronounced [p<sup>h</sup>æ<sub>Λ</sub>ˈsilə] in Western Danish regiolects but [p<sup>h</sup>æ<sub>Λ</sub>ˈsələ] in Standard Danish. Some differences are due to different allophonic rules. For instance, there is a general tendency to pronounce /u(:)/ as [o(:)] when it occurs after /r/ in Standard Danish, and likewise a tendency to lower /ɛ/ to [ɛ] between /j/ and /r/ in the Western Danish regiolects as opposed to [æ] in Standard Danish. Such differences are well known, though not all described in detail. What is not known, is if there are more general differences between the regiolects regarding the realization of the various allophones.

We intend to give an acoustic description of the monophthongs of three Danish regional variants, and to see whether there are any systematic acoustic differences in the realizations of the ‘same’ allophones in these three regiolects. We exclude allophones caused by the presence of /r/. (/r/ is a pharyngeal approximant in prevocalic position, and postvocally it weakens to a semivowel, [ɹ], if it does not merge completely with the preceding vowel. Vowels neighbouring /r/ would accordingly create inherent insurmountable segmentation difficulties.) We base our analysis on spontaneous speech, for two reasons. First, it is obvious that there is a difference between spontaneous and read speech, though when it comes to the phonetic realisations of the phonemes, there is no knowledge of the quantitative differences. Second, during primary school all Danish pupils are taught to read aloud in a way that is shaped by the standard norm. For those who speak other regiolects than Standard Danish, this means that reading aloud almost inevitably triggers the use of a norm that is different from their everyday language.

## 2. MATERIAL

We want to describe the vowels as they occur in ordinary spontaneous speech. However, in the light of our particular interests it is not feasible to base our analysis on free spontaneous speech because phonemes do not occur with equal frequency. To ensure adequate coverage of all the vowel sounds, we have developed a method which is a conceptual fusion between word lists and interviews. Our point of departure is a list of words that contains our target vowel sounds. These words are rendered in drawings, which we make the subjects talk about. The words are carefully chosen so that we may safely assume that they will be familiar to all our speakers. A second requirement is that they must lend themselves easily to graphical illustration. For some vowels words abound, others are much more troublesome. Having excluded allophones caused by the presence of /r/, [œ:] occurs in one word only (*høne* ‘hen’). We therefore exclude [œ:] from further analysis.



**Figure 2:** Example of a drawing and the test words it was designed to elicit.

We use two types of drawings:

1. Complex drawings where each drawing contains as many related objects and concepts as possible, in order to create a universe that we can make the subjects talk about. The idea is that this will enable them to draw upon associations in order to ease the identification of the objects we want them to talk about, as well as giving the objects a context that should enable the subjects to elaborate on the relations between them. Figure 2 is an example.
2. Collages, containing a number of semantically unrelated drawings, which give us the opportunity to make the subjects explain the placement of each drawing relative to the others, thus inviting them to repeat our target words.

We use a number of strategies to ensure that the subjects stay as close as possible to their everyday language:

1. We record the subjects in their local area. We do not go to their private homes, in order not to impose on them the added stress of being host to us.
2. We put an effort into creating a relaxed and informal atmosphere during the interview.
3. When we interview subjects from the provinces, they are interviewed by a person who speaks the same regiolect.

These precautions are necessary because Standard Danish has a higher status than the regiolects. Most people living outside the capital are to varying degrees capable of speaking Standard Danish. Whenever the situation calls for it, they will speak their version of Standard Danish, and an interview with two researchers from the capital is likely to be such a situation, unless we do something to prevent it. We avoided using any of the target words, until the subjects had introduced them. This is to ensure that they use only words that are familiar to them and part of their vocabulary, and that they do not just mimic our pronunciation. Of course, this means that we may miss some target words because the subjects use other lexical items for some objects, or render them with phrasal constructions.

### 3. SPEAKERS AND RECORDINGS

The three Danish regiolects are:

1. Standard Danish, as spoken by native inhabitants of Copenhagen
2. Southern/central Zealandic regiolect, as spoken by native inhabitants of Næstved
3. West/mid Jutlandish regiolect, as spoken by native inhabitants of Herning, cf. figure 3.

Standard Danish is a well described norm with which the two regiolects can be compared. The particular regiolects are chosen because they are our respective mother tongues, thus enabling us to communicate with our subjects without imposing an undesired linguistic norm on them. Næstved and Herning are modern provincial cities of comparable size (50,000 and 65,000 inhabitants respectively). They serve as economical and educational centers in their respective regions. Greater Copenhagen has a population of approximately 1,5 million inhabitants.

We interviewed 18 persons: 3 males and 3 females from each of the 3 regions. All informants were between 18 and 28 years of age. To be considered ‘native inhabitant’ we require the subjects to be born, raised, educated (at least through primary school) and still living in the particular region. We have not taken any social parameters into account.

We used a HBB CD-recorder, a Behringer Ultragain Pro 2200 Microphone Preamplifier, and a Sennheiser mkh 40 P48 condenser microphone with cardioid (unidirectional) polar pattern. In Copenhagen the subjects were recorded at our institute in a sound treated recording room. In Næstved we used a library room at a public school, during the summer holidays, and in Herning a music room at a municipal youth club, after closing time. The recording rooms used in the field were not sound treated, but carefully chosen to ensure quiet surroundings. Subject and microphone were placed in the room with uneven distances to the major surfaces. The microphone was



**Figure 3:** Map of Denmark with our target regions.

placed in front of the subject on a floor stand, 30 degrees off the mid-sagittal plane, at a distance of approximately 50 cm. This distance is probably somewhat larger than usual, but it has the advantage of minimizing amplitude variation caused by minor variations in the distance between the speaker's mouth and the microphone, thus allowing the subjects a bit more freedom to move. The drawings were placed in front of the subjects in a special holder in an upright position, to ensure that the subjects sat upright, rather than crouched over the paper. Subject and interviewer sat at one table, while the other author, from a discrete distance at another table, monitored the recording technically, and - more importantly - also kept a word count to ensure a sufficient number of repetitions of each test item. This meant that the interviewer could devote his attention entirely to the social demands of the situation, making sure the subjects felt at ease.

### 4. ANALYSIS AND PRELIMINARY RESULTS

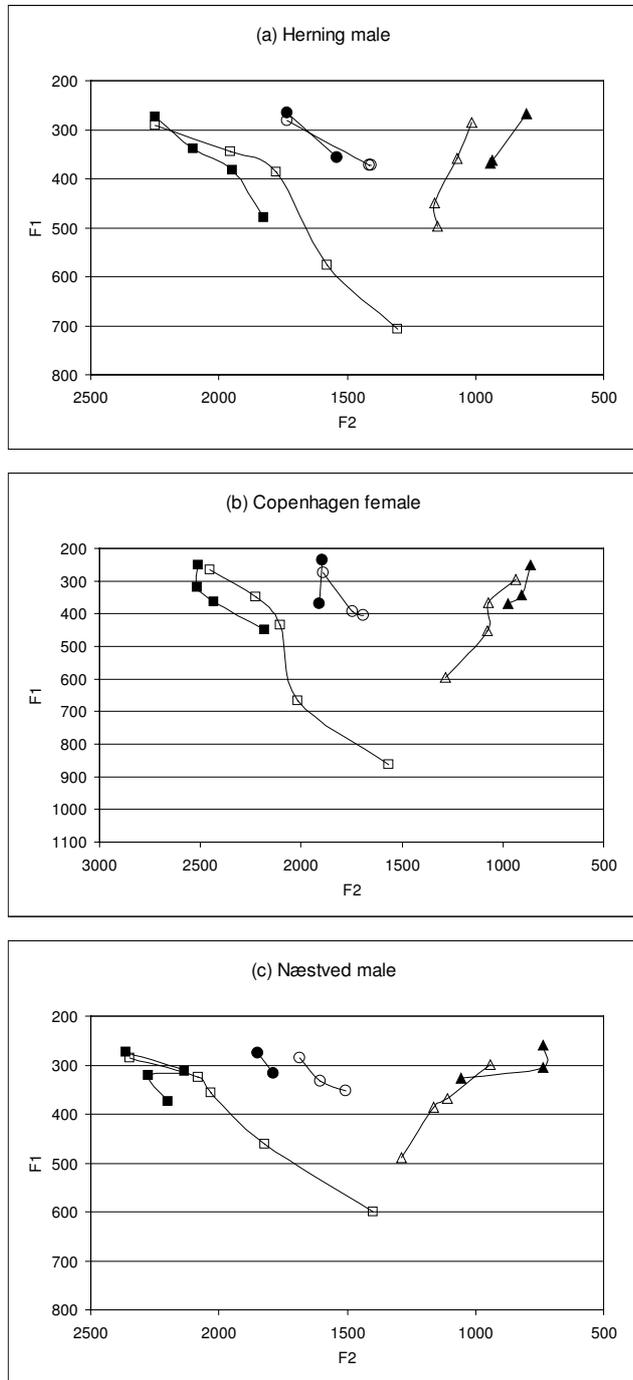
The CD recordings were transferred to a PC using Exact Audio Copy [www.eac.de]. They have been intensity level adjusted and edited into manageable file chunks using Cool Edit Pro [www.syntrillium.com]. Praat 4.0.13 [www.praat.org] was used for the acoustic analysis. A number of Praat scripts and Perl programs were written to automate the processing of the material.

The first stage was to identify all target words and classify and label them according to target allophone and stress. We distinguish five degrees: ordinary stress, weak stress, no stress, extra stress and strong emphasis. Initially, we only want to look at syllables produced with ordinary stress. At a later stage we intend to compare words with different degrees of stress. For each vowel we mark onset and offset in order to measure duration, and we mark a suitable place near the middle for measuring formant frequencies. Formants were determined with Praat's Formant (Burg) facility, with suitable arguments for individual speakers.

So far we have looked at data from six subjects and chosen three for presentation here, a male from Herning (figure 4a), a female from Copenhagen (figure 4b), and a male from Næstved (figure 4c). The average values presented here are based on 6 to 35 measurements (typically between 10 and 20). The three speakers depicted in figure 4 present three different patterns, most clearly so with respect to the front vowels. Whether we are dealing with proper regional differences or mere individual differences, we do not yet know. The differences are not likely to be gender determined. For the moment, and to be on the safe side, we will assume that the three trends are individual features.

The non-low front vowels are those that most clearly distinguish the three speakers. The unrounded front vowels of the Herning speaker (figure 4a, squares) adhere

to the standard norm, i.e. [i i: e e: ε ε:] are pairwise of the same tongue height (to judge from F1), whereas [æ: a] differ. He does not differentiate [ø] and [œ]. Apparently he does not differentiate [o:] and [ɔ:] either. However, those two vowels do not sound alike; this is due to a diphthongal manifestation of /ɔ:/, that is either [ou̯] or [ɔ̯u̯],



**Figure 4:** F1-F2 plots of short and long vowel sounds from a Herring (a), a Copenhagen (b), and a Næstved (c) speaker.

Filled squares: [i: e: ε: æ:]. Open squares: [i e ε a].  
 Filled circles: [y: ø:]. Open circles: [y ø œ].  
 Filled triangles: [u: o: ɔ:]. Open triangles: [u o ɔ ʌ].

whereas the manifestation of /ɔ:/ is a monophthong [ɔ:]. The Copenhagen speaker has apparently shifted long [e: ε: æ:] upwards, to the effect that the distance in height between [i: e:] and [e: ε:], respectively, is very small indeed; and [æ:] is on level with [ε]. Her distance between [o: ɔ:] is small, but clearly audible, whereas [ø] and [œ] merge. The Næstved speaker is curious in his front unrounded pattern: [ε:] and [æ:] have shifted upwards, but they are also fronted relatively, which ensures their auditive identity. As with the Copenhagen speaker [æ:] is of the same height as [ε].

The Copenhagen and Næstved speakers both exhibit a radical crowding in the upper left quadrant. Much more than one would expect from the data in [1] and [2]. We believe we are witnessing a sound change in progress, where the long unrounded front vowels lead and the short counterparts lag somewhat behind. The likely outcome is a merger of /e(:)/ and /ε(:)/. Whether it is an Eastern Danish phenomenon or not is too early to say.

When we set out to do this investigation, we decided not to include the allophones caused by the presence of /r/. In hindsight this is the most regrettable decision, since listening to our material has made us strongly suspect that the /r/ colouring may be one of the clearest regionally determined phonetic (phonological) differences. We intend to look at our material again in search of such /r/ coloured vowels. We are quite certain that we will find enough of them to at least form a hypothesis, and we are just as certain that we will need more material to fully uncover those differences between the regiolects.

## REFERENCES

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