

IS DANISH 'sj-' ONE OR TWO SOUNDS?

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The opinions held by phoneticians about the phonetic nature of the sound (here called 'sj') which in genuine Danish words corresponds to the letters sj- (as in sjælden 'seldom') differ widely. In the two official textbooks for the course in general and Danish phonetics (Andersen (1), Fischer-Jørgensen (4); also Hansen (5)) it is stated that the sound in question is in fact a palatalized s followed by a j (which is normally described as unvoiced). Uldall (11), Arnholtz & Reinhold (2), and Martinet (8) (1937) call the Danish 'sj' one sound, a sort of $\underset{\sim}{j}$. Jespersen (6), Diderichsen (3), Koefoed (7), and Spore (9) only say that Danish 'sj' may be pronounced as one or two sounds. The opinion of Martinet (10) (1949) is not clear.

All the above-mentioned authors seem to base their opinions only on auditory observations; it might therefore be interesting to make an acoustic investigation on this point (but it was not intended to give a general acoustic description of Danish 'sj').

As there is never in Danish commutation between s+j and $\underset{\sim}{j}$ (but there is between s and 'sj'), the manifestation of /sj-/ (corresponding to sj in the orthography) can be rather varying. But one manifestation is generally considered to be the normal one in standard Danish.

A series of 25 Danish words (with initial sj, s, fj, f, tj, and a few others) were recorded from 12 persons.

Four persons having a professional knowledge of the norm of the standard language judged whether these recordings were normative, particularly concerning the pronunciation of 'sj'. (Andersen identified most of the 'sj's as the sound he had transcribed [$\underset{\sim}{s_j}$] in his book (1).)

No attempt was made to give an absolute definition of 'one sound' (-segment). The method was one of comparison of spectrograms, in order to see whether Danish 'sj' clearly resembles segments which are always described as one sound (e.g. English $\underset{\sim}{j}$ in 'she') or segments which are always described as two sounds (e.g. Russian sjj in 'Cbя').

The procedure was as follows: spectrograms with Russian [s_jæ] and [s_jjæ], with French [aʃe] and [aʃje], with British [ʃu:] and [sju:], with German [ʃ,ç, s] and [ʃç, sç], and with Danish [fɛlʔ] and [fjɛlʔ] (and a few others) were compared in order to determine which acoustic characteristics correspond to the auditory impression of a j after an unvoiced fricative; or, more exactly, to find some acoustic differences between fricative + j + vowel and fricative + vowel. (All the above-mentioned examples are phonemically different). Four such criteria (which are not constant) were found:

- (a). A shift in intensity in the unvoiced segment (s being more intense than j). This is not an important criterion.
 - (b). A shift in the distribution of spectral energy in the unvoiced segment. This is the most important criterion, as Danish j has another distribution of energy than s, s_j, and ʃ.
 - (c). A voiced segment (after the unvoiced one) with less intensity than the vowel and a low F1.
 - (d). The vowel transitions may be important, but as the transitions of F2 and F3 from ʃ to the vowel e.g. in [ʃæ] can be similar to the initial bendings of these formants in [jæ], this criterion is not so important as (b) and (c), but more important than (a).
- The length of the various segments and transitions must be taken into account.

Then all the spectrograms of Danish 'sj' were examined in order to determine whether any of the acoustic criteria (abcd) for j were present. The main conclusion is that the persons whose pronunciation of 'sj' was found completely normative by all the 'language norm judges' only had one 'sound segment' before the vowel, i.e. they had none of the acoustic criteria (abcd) for the presence of j (cp. Figs. 1 & 2). But in the material as a whole all degrees between clearly one and clearly two segments were found, with a significant majority for one segment.

As Danish 'sj' has been described as ʃ, s_j, and s_jj, the following test was made. English shock, Russian ЦбЯ and ЦЯ, and Danish sjal were recorded on the segmentator. Then still greater parts of the initial consonant + the vowel transitions of each of these four words were cut off, and by each new cutting four well-trained phoneticians described the initial sound auditorily

in as great detail as possible. Everything was recorded on tape and on an oscillograph. It should be determined whether the 'cutting evolution' of Danish sjal clearly resembled the 'cutting evolution' of one of the three foreign words more than that of the others. Particularly it was to be tested whether (by some stop in the cutting) a j could be heard in some but not all of the four words, and if this were the case, how Danish 'sj' would be in this respect.

No clear results were found although when the word was cut just when the vocal vibrations start, there was a tendency to hear a diphthong [iæ] in Russian СбЯ, but a (dental) stop + a vowel in the three other words). Nevertheless the method might prove useful with greater material and a more elaborate procedure (e.g. involving spectrographical recordings of the test words in order to find some acoustic 'fix-points' where you could cut, so that the cut test words can be more easily comparable).

References:

- (1) Poul Andersen, Dansk fonetik, Chapter XV of Nordisk Lærebog for Talepædagoger (1954), p. 341.
- (2) Arnholtz & Reinhold, Einführung in das dänische Lautsystem mit Schallplatten (1936), p. 49.
- (3) Paul Diderichsen, Danish Pronunciation (Key to Gramophone Record)² (1953), pp. 16-17.
- (4) Eli Fischer-Jørgensen, Almen fonetik³ (1962), pp. 68-69.
- (5) Aage Hansen, Udtalen i moderne dansk (1956), p. 83.
- (6) Otto Jespersen, Modersmålets fonetik² (1934), pp. 38-39.
- (7) H. A. Koefoed, Teach Yourself Danish (1958), § 27.
- (8) André Martinet, La phonologie du mot en danois (1937), p. 39.
- (9) Palle Spore, La langue danoise (1965), p. 42.
- (10) Ingeborg Stemann, Manuel de la langue danoise (1949), p. 39 (the phonetic section is by André Martinet).
- (11) H.J.Uldall, A Danish Phonetic Reader (1933), p. IX.