

/r/ in some Swedish dialects: preliminary observations

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Abstract

Acoustic and auditory properties of r were examined in nine Swedish dialects. The sounds were produced in intervocalic position by several upper middle aged male speakers. Approximant r variants outnumbered fricatives and taps. Trills occurred just marginally. Acoustical analysis of the approximants suggested a fair amount of overlap between dialects in the F2/F3 space, but some dialects were relatively well separated. Auditorily, four place categories (prealveolar, postalveolar, retroflex and back) could be discerned fairly reliably. These were separated to some extent in the F2/F3 space, but retroflex and back r could not be separated solely in terms of F2 and F3. This acoustic similarity may contribute to explaining the notorious articulatory variability of r.

1 Introduction

R-sounds display extensive phonetic variation across and within languages and dialects (e.g., Lindau, 1985). In the Swedish dialect literature, special attention has been paid to the distinction between front and back r. This focus is probably due to the fact that the front/back dimension provides a basis for a relatively sharp dialect boundary between a northern and a southern dialect region (Sjöstedt, 1936; Elert, 1981). As pointed out by these authors, however, phonetic r variation can be found also within smaller dialect areas.

The phonological definition of r includes its tendency to pattern with laterals in the larger class of 'liquids' (cf. Jakobson et al., 1969). In consonant clusters, for example, r tends to appear near the syllabic nucleus. However, an invariant phonetic basis for this behaviour remains to be identified. Lindau (1985) proposed a low F₃ as a common property of r, but this hypothesis received little support in her cross-language material. Low F₃'s for r were found in only two of several languages (notably American English). Lacking evidence for acoustic invariance, Lindau suggested that r variants may be related in terms of the Wittgensteinian notion of 'family resemblance'.

At the present stage, however, further advances in the theoretical analysis of r requires more data from several languages and dialects. The present study aims to make a modest contribution in examining r sounds found in a number of Swedish dialects.

2 Method

The speech material consisted of recordings of the word *fara* 'go, travel'. The informants were upper middle aged male speakers of nine dialects located near the traditional borderline between front and back r (Burseryd, Bredsåtra, Frillesås, Heberg, Järnsås, Rimforsa, Segerstad, Stenberga and Öxabäck). There were three speakers per dialect, and each speaker produced the test word 3-5 times. The recordings were extracted from a dialect database containing speech samples from more than 100 Swedish dialects.

All word samples were subjected to auditory and acoustical analysis. Attempting to categorise all r variants according to manner of articulation, both authors listened carefully to the entire material while observing spectrographic correlates of the respective manner types. For the approximants, a comparison of formant frequencies across dialects and speakers was made in an attempt to assess the acoustic correlates of places of articulation as judged on an auditory basis. Four places of articulation, 'prealveolar', 'postalveolar', 'retroflex' and 'back', could be distinguished auditorily with a relatively high degree of confidence. Preliminary auditory observations also suggested a systematic place variability in the back category (from front velar to uvular), but these observations could not be reliably replicated, nor could they be associated with specific spectral correlates.

3 Results

The pie diagram in Figure 1 shows the frequency of occurrence of different manners of articulation. The data are pooled across dialects and speakers. It can be seen that the approximants outnumber the remaining categories, that the fricatives and taps come second, and that the incidence of trills is quite marginal.

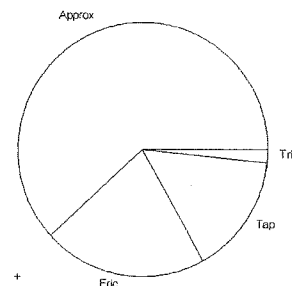


Figure 1. Proportional incidence of approximants, fricatives, trills and taps in the present r material.

The scatter plot in Figure 2 illustrates the distribution of F₂/F₃ pairs in approximant r variants pertaining to all nine dialects. The dialects are represented by two or three speakers, and each symbol represents one utterance (the symbols are explained in the legend). However, some dialects are underrepresented due to difficulties in measuring F₃. Overall, F₂ ranges between approximately 850 and 1450 Hz, and F₃ ranges between approximately 1600 and 2900 Hz. It is evident that there is a considerable variability in F₂ and F₃ across and, to a certain extent, within dialects. However, some of the dialects are relatively well separated as illustrated in Figure 3. The r sounds of these three dialects sound prealveolar (Rimforsa), retroflex (Bredsåtra) and uvular (Burseryd), respectively. The ellipses cover 90 percent of the theoretical data distribution.

Figure 4 shows an F₃ vs. F₂ scatter plot for the prealveolar, postalveolar and retroflex places of articulation pertaining to approximant r variants across the dialects. It can be seen that 1) prealveolars tend to have higher F₂ and F₃ than the postalveolars and retroflexes, 2) the postalveolars tend to have lower F₃ than the remaining categories, and 3) the retroflexes tend to have lower F₂. However, there is an area of overlap between the three categories roughly in the 1100-1200 Hz F₂ region and the 1900-2300 Hz F₃ region. This overlap is probably due to listeners' limited capability of discerning several adjacent places of articulation (cf. Engstrand and Livijn, 2001).

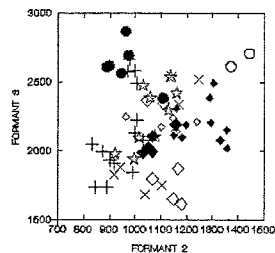


Figure 2. F_3 vs. F_2 (Hz) as measured in r variants in the nine dialects. The symbols are as follows: Unfilled squares—Frillesås, filled squares—Rimforsa, unfilled circles—Öxabäck, filled circles—Burseryd, unfilled diamonds— Segerstad, filled diamonds—Bredsåtra, crosses—Heberg, pluses—Stenberga, stars—Järsnäs. Further explanation in text.

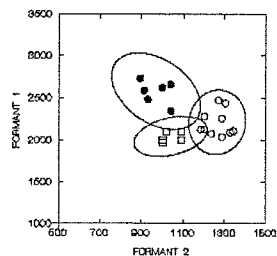


Figure 3. F_3 vs. F_2 (Hz) for r realisation in the Burseryd (filled circles), Rimforsa (unfilled circles) and Bredsåtra (squares) dialects.

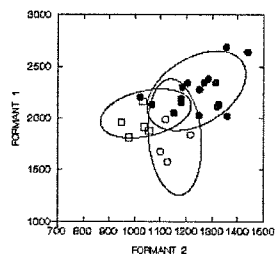


Figure 4. F_3 vs. F_2 for prealveolar (filled circles), postalveolar (unfilled circles) and retroflex (square) r sounds.

Finally, Figure 5 presents F_2 and F_3 data for the back and the retroflex r sounds. The small ellipse represents the retroflex category which is almost entirely contained in the back area. This overlap demonstrates that retroflex r cannot be separated from back r solely in terms of F_2 and F_3 . Unfortunately, F_4 could not be measured reliably in the present material, and the difference in F_1 is probably negligible (with means at 547 and 504 Hz for the back and retroflex categories, respectively). It is reasonable to assume that this acoustic similarity corresponds to a considerable auditory similarity and, thus, provides a partial explanation of the fact that 'back' and 'front' r variants tend to alternate in some dialects.

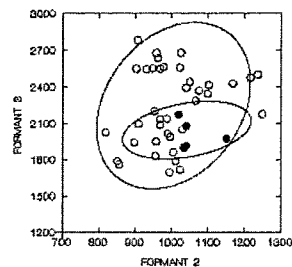


Figure 5. F_3 vs. F_2 for back and retroflex r variants.

4 Summary and conclusions

Preliminary acoustic and auditory observations were made on intervocalic r in nine Swedish dialects. The data suggested that approximants outnumber other manners of articulation; in particular, trills occurred rarely. Although acoustical analysis indicated that r separated some dialects in the F_2/F_3 space, there was also a considerable overlap. An auditory classification in terms of place of articulation was attempted for the approximants. Four place categories ('prealveolar', 'postalveolar', 'retroflex' and 'back') could be discerned at a reasonable level of confidence. To some extent, these were separated in F_2/F_3 space. But again, overlaps were found such that, in particular, the retroflex category was a subset of the back category. Thus, retroflex r could not be separated from back r solely in terms of F_2 and F_3 . This suggests a degree of acoustic and auditory similarity between different r sounds that may help explain their articulatory variability. The articulatory/acoustic relationships in various r approximants should be further explored using articulatory synthesis techniques now available in our laboratory (Stark et al., 1998).

Acknowledgments

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References

- Elert, C.-C. (1981). 'Gränsen för det sydsvenska bakre r'. *Ljud och ord i svenskan 2*, Stockholm: Amquist & Wiksell International.
- Jakobson, R., G. Fant and M. Halle (1969). *Preliminaries to speech analysis*. Cambridge, Massachusetts: The MIT Press.
- Lindau, M. (1985). 'The story of /r/'. In V. Fromkin (ed.), *Phonetic linguistics* Orlando: Academic Press.
- Livijn, P. and O. Engstrand (2001). 'Identifying places of articulation in coronals: A combined EPG and listening test'. *This volume*.
- Sjöstedt, G. (1936). 'Studier över r-ljuden i sydsvenska mål'. Dissertation, Lund University.
- Stark, J., C. Ericsson, B. Lindblom and J. Sundberg (1998). 'The APEX model: from articulatory position to sound'. *J. Acoust. Soc. Am.* 104, 1820.