

# Formant Structures of Vowels Produced by Stutterers at Normal and Fast Speech Rates

Fabrice Hirsch, Fayssal Bouarourou, Béatrice Vaxelaire, Marion Béchet, Jean Sturm, Rudolph Sock & Gilbert Brock

Phonetics Institute of Strasbourg – E.A. 1339 – LiLPa -Composante Parole et Cognition – Université Marc Bloch, 22 rue Descartes, 67084 Strasbourg, France  
fabrice\_hirsch@yahoo.fr

The purpose of this investigation is to analyze the formant structure of vowels produced by stutterers and treated stutterers, by comparing their data with those of control subjects. Moreover, we will study the effects of speech rate increase on the formant structures of the vowels, and that of the three groups of speakers.

We chose to analyze French oral vowels [i, a, u], from spectrographic data, in two speech rate conditions: normal and fast. By studying these vowels, it becomes possible to explore the limits of the maximum vocalic space, since their productions would reflect maximum articulatory abilities of a speaker, in producing vowel gestures. The three vowels were introduced in [CV] syllables where [C] could be [p], [t] or [k] in order to observe for contextual influences. The sequences were placed in sentences which were repeated ten times by stutterers, treated stutterers and control subjects.

Concerning control subjects, several studies (Lindblom, 1963 for example) have shown that an increase of speech rate could provoke a compression of durations and a reduction of the vowel space, *i.e.* a certain centralization of vowels in this space. However, this phenomenon of centralization was only observed for two vowels, *i.e.* for [i] and for [u].

What would the result be for stutterers or former stutterers, knowing that the majority of studies (Klich and May, 1982) has shown a centralization of the vowel space in normal speech rate condition for stutterers? In this perspective, a Blomgren *et al.* (1998) more recent work confirmed a reduction of the vowel space in fluent speech of stutterers. However the Prosek *et al.* (1987) work contradicted such conclusions, as no vocalic centralization appeared in fluent or disfluent speech of stutterers.

The present investigation is of double interest: a) it attempts to provide additional data concerning a possible reduction of the vowel space of stutterers in normal speech rate; b) it tries to verify whether an “undershoot” phenomenon in fast speech rate would appear or not. Our hypotheses are: a) a more restricted vocalic space should be noticed in stutterers’ fluent speech; b) consequently, no further vowel centralization should be observed when stutterers speak faster.

Results show that the formant structure of vowels [i, a, u] is comparable for treated stutterers and for control subjects, whereas it is different for stutterers. F2 is especially responsible for this configuration: it suggests fronting of the tongue.

Furthermore, an “undershoot” phenomenon has been observed for controls and treated stutterers in a fast speaking condition. This centralization is not noticed in non-treated stutterers’ speech, since area of the vowel is similar in the two rate conditions. Thus stutterers do not show variations of vowel space when they speak faster.

## REFERENCES

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