

Do rhythm measures separate languages or speakers¹?

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Ever since Pike and Abercrombie had suggested that all languages can be divided into stress-timed and syllable-timed, the so-called 'rhythmic differences' between the languages have attracted substantial attention from phoneticians. Although experimental studies so far found no evidence for isochrony as such, various quantitative statistical indices have been proposed to capture the rhythmic properties of languages.

In this paper we compare 15 measures of durational variability based on an automatic segmentation of speech into vowel-like and consonant-like regions. Our corpus consisted of a total of 3059 short texts recorded from 62 speakers of Southern British English, Standard Greek, Standard Russian, Standard French and Taiwanese Mandarin. We used an automated algorithm to segment the data into vowel-like and consonant-like segments. This allowed us to apply identical segmentation criteria to all languages and to compute rhythm measures over a large corpus.

To compare intra-group variation in rhythm measures (RMs) to inter-group variation, we applied classifier techniques. We measured how often we can correctly predict the language, based on one or more RMs.

The performance of classifiers depended on the number of dimensions. While there was a significant difference in the performance of the classifiers based on single measures to classifiers based on three measures, there was only little improvement in the performance of classifiers based on more than three rhythm measures. This suggests that rhythm is at least a three-dimensional phenomenon and is best captured by a combination of more than two measures.

The most efficient classifier based on all 45 rhythm measures correctly identified the language of 61% of the data (chance=30%). This shows that although there are rhythmic differences between languages, substantial variation within languages makes it impossible to reliably separate languages based on the rhythm of a single paragraph.

At the same time, we have found that classifiers performed surprisingly well in identifying speakers of the same language. For example, for English classifiers based on three measures correctly identified the speaker of 48% of the data (chance=8%). Thus the differences between speakers of the same language appear to be more consistent than the differences between different languages. This finding raises interesting questions about the nature of individual variability in duration. It also shows that any future study requires a representative sample of speakers to avoid the danger of measuring differences between people rather than languages.

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