

## **How far does first language rhythm influence second language rhythm?**

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Subjective impressions suggest that rhythm contributes to the perception of a speaker's accent as being non-native. This research explores the influence of first language speech rhythm on second language production, testing the utility of a range of recently-developed metrics of speech rhythm. We examine Spanish spoken as a second language by native English speakers and English spoken as a second language by native Spanish speakers.

It has long been asserted that Spanish and English fall into distinct rhythm classes. Romance languages, such as Spanish, are described as syllable-timed and Germanic languages, such as English, are described as stress-timed (Pike, 1945). Initial attempts to quantify this distinction unsuccessfully sought evidence for isochronous units in speech – the syllable in syllable-timed languages and the foot in stress-timed languages (Abercrombie, 1967; Lehiste, 1977).

Recent work on rhythmic classification exploits contrasts in syllable structure between stress-timed languages and syllable-timed languages. Ramus, Nespors and Mehler (1999) propose indices of these contrasts: specifically, the standard deviation of vocalic and intervocalic intervals, and the total percentage of the utterance occupied by vowels. They show that combinations of these measures successfully capture the stress/syllable-timed distinction between a range of languages. Taking a parallel approach, Grabe and Low's (2002) use a pairwise variability index to exploit specifically the durational contrast between successive stressed and unstressed syllables, which tends to be much greater in stress-timed languages.

We recorded native Spanish speakers and native English speakers proficient in Spanish, all reading the same set of Spanish sentences. Likewise, we recorded native English speakers and native Spanish speakers proficient in English, reading a set of English sentences. Utilising the rhythm metrics of Ramus *et al.* and Grabe and Low, together with subsequent modifications (Barry *et al.*, 2003; Dellwo & Wagner, 2003), we set out to characterise the rhythmic differences between native and non-native speakers of the two languages.

We find that the primary rhythmic indicator of second language accent appears to be an influence of native language on the degree of variation of vowel duration. Thus, English speakers of Spanish show variation in vowel duration that is greater than in the Spanish of native speakers, but less than in English. Likewise, Spanish speakers of English show less variation in vocalic intervals than do native speakers of English, but greater vowel duration variation than is found in native Spanish, a result echoing Carter's study (in press) of the English of American Hispanic bilinguals. Metrics relating to variation in consonantal interval show a strong language dependence, regardless of speakers' linguistic origins.

We conclude that some of the recently developed rhythm metrics provide useful insights into the degree of rhythmic adaptation by second language speakers.

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