

SYLLABLE STRUCTURE AND SENTENCE RHYTHM — A CROSS-LANGUAGE STUDY

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The rhythm of language is usually taken to mean the organization of stresses and syllables into phrase groupings, analogous to the metric feet in poetry. The terms 'syllable timed' and 'stress timed' are thus applied to languages whose phrase rhythms seem to be organized around either all of the syllables of the phrase or just the stressed syllables, resp. However, if one listens to two languages of the same type, for example English and German, one is struck by the rhythmic DIFFERENCES that remain. These differences force us to consider other possible sources for the rhythmic character of languages, for example, how segments are organized into syllables, phrases into breath groups, and breath groups into paragraphs. The first of these, that is, the rhythmic effects of the way segments are organized into syllables, is the focus of the research reported here.

We chose to study the interrelationship between the initial consonant-vowel sequence of a syllable and the final segments of the preceding syllable, since it seemed to us that the articulatory organization of this inter-syllabic region might contain some of the information that gives the syllables of a language their particular rhythmic flavor. Earlier work has shown, for example, that the rhythmic beat associated with a stressed syllable in English precedes the onset of the nuclear vowel of the syllable by an amount that is positively correlated with the length of the initial consonant cluster of the syllable; that is, the longer the duration of the initial cluster, the earlier in the syllable will the perceived rhythmic beat appear to fall. It is perhaps intuitively reasonable to hypothesize, on the other hand, that segments in OTHER syllables should have little effect, if any, on perceived beat location; that is, the beat should fall in the same place in a syllable regardless of the nature of other syllables nearby.

In French, however, the situation is apparently different: the final consonants of a syllable are said to group with the initial consonants of the next syllable to form a grand cluster. That is, where in English we should have 'my stick' and 'mice tick', French would have only 'my stick'. Finally, Polish should be more like English than like French with respect to this consonant grouping phenomenon.

We therefore composed a set of three nonsense utterances that would exploit this

presumed difference between English, Polish, and French: /a la kárt sap fáʃ də le pláʃ /, /a la kárt sa fáʃ də le spláʃ/, and /a la kárt sa pfáʃ də les pláʃ/. At two different stressed syllable locations in the sentences, three consonant sequences were contrasted around the juncture boundary between syllables. In utterance one, for example, we have the syllables /sap fáʃ/, containing the sequence vowel-consonant-juncture-consonant-vowel, as compared to the other two utterances, which contain the sequences vowel-juncture-consonant-vowel, in utterance number two, and vowel-juncture-consonant-consonant-vowel in utterance three. The structures associated with the last stressed syllables of the three utterances are analogous, but more complex, involving an additional /l/ segment. According to the description of sequential syllable structure given earlier, English and Polish should have the rhythmic beat for the first stressed syllable fall in similar locations in the first and second utterances, ignoring the presence or absence of the final /p/ in the preceding syllable; these two beat locations should contrast with that for the third utterance, where the presence of the /p/ in the initial cluster should displace the rhythmic beat forward in the syllable. In French, however, the beats should be similar in the second and third utterances, indifferent to the location of the juncture, and the first utterance should be the different one, the beat being relatively later in the syllable.

Two native speakers of each language repeated these three sentences a number of times, treating each sentence as if it were a nonsense utterance in his own language, and from these repetitions one example was chosen that contained no hesitations or awkward pronunciations. Each of these eighteen utterances was copied onto a four second tape loop for presentation through head phones to two other native speakers of each language. The listeners were directed to tap their finger on a copper plate in time to the rhythm of an utterance, and no attempt was made to constrain their manner of tapping. During each revolution of a tape loop, an unheard timing pulse on track one shortly preceding the onset of the utterance on track two reset a computer's milli-second clock to zero. Each time the listener tapped his finger, the computer stored the time of occurrence of that tap. At the end of a certain number of revolutions the sound was turned off, the data for that utterance were stored on computer tape, and a new utterance was begun. The resulting data were tap locations, in milliseconds, relative to the timing pulse on track one of each loop.

The first result concerns the variability with which the listeners tapped. The different subjects showed great differences in tapping, but there was a PATTERN to their variability: a listener tapped with LESS VARIABILITY on the utterances that had been spoken by native speakers of his own language than on the utterances that had been spoken by foreigners. It was as though he had an immediate intuitive 'understanding' for the rhythm of his own language that did not extend to other languages, even though he might in fact speak these other languages.

There were also consistent differences in average tap location for the different phonetic types of syllable structure represented in the stimulus utterances. The average tap location for the syllable /fá/ in second utterance was about 50 milli-

seconds later than that for the comparable syllables of the other two utterances. That is, the presence of the extra /p/, either before or after the juncture, served to displace the felt beat location forward in time by 50 msec. The situation was similar for the presence vs. absence of the /s/ in the last beat location of the utterances. The location of the juncture appeared to have no effect on beat location, in any of the languages, a counter-intuitive result.

Finally, there was no difference between languages in beat location, perhaps because the French speakers articulated too carefully.

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DISCUSSION

LEHISTE (Columbus, Ohio)

Just a question for information. Did the listeners know what language the nonsense-utterances were supposed to represent?

ALLEN

Of each pair of listeners who spoke a given language, one heard all of the utterances from one language together in one sitting and was told which language the utterances were supposed to be in, the other heard all of the utterances in all of the languages mixed randomly, again in three sittings total, and was not told what language each utterance was supposed to be in. There was no apparent difference in responses between the two conditions of presentation, but then such a difference could easily have been obscured by the large response variability.

HEWSON (St. John's, Nfld.)

The suggestion that syllable final consonants in French are attached to the initial consonant of the following syllable to form a cluster is only an impression, never verified by experimental evidence. This impression probably arises from the following facts:

(1) there is regressive assimilation even over morpheme boundaries: [lɛfis] *the son*; [lɛ fiz dy rwa] *the king's son*.

(2) the canonical structure of the syllable in French is CV(c): where V or VC occur, the final C of the preceding syllable is utilized phonetically as an initial C for V and VC occurrences; [œ grã tɔm] *un grand homme*.

(3) suppression of schwa is normal in concatenated speech, provided (normally) that the CVC pattern can be maintained: *Je ne le retenais pas* [ʒɛn lɛr tɛ nɛ pa].

NOOTEBOOM (Eindhoven)

Just one simple question. The hypothesis that syllable structure in French is different from that in English stems, as far as I know, from the traditional ideas of teachers of French. Do you know of any experimental evidence that supports this idea?

ALLEN

Nooteboom's question is partly answered by Hewson's comment, but research has also been done by Delattre and his students. One article is by Delattre and Olsen, "Syllabic features and phonic impression in English, German, French and Spanish", (*Lingua* 22:[1969] 160-175). A comparison of structural types of 2000 syllables chosen from running narrative and dramatic text in each of the four languages showed that French and Spanish have a clear tendency toward simpler syllable structures (e.g., CV and CVC).