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A language-specific comprehension strategy

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Infants acquire whatever language is spoken in the environment into which they are born. The mental capability of the newborn child is not biased in any way towards the acquisition of one human language rather than another. Because psychologists who attempt to model the process of language comprehension are interested in the structure of the human mind, rather than in the properties of individual languages, strategies which they incorporate in their models are presumed to be universal, not language-specific. In other words, strategies of comprehension are presumed to be characteristic of the human language processing system, rather than, say, the French, English, or Igbo language processing systems. We report here, however, on a comprehension strategy which appears to be used by native speakers of French but not by native speakers of English.

Underlying our finding is a structural difference between the two languages: French and English differ considerably in the degree to which syllable boundaries are clear and unambiguous. In French, syllabic structure is relatively easily determined[1]; the first syllable of *balance*, for example, is clearly *ba*, the first syllable of *balcon* clearly *bal*. In English, however, syllable boundaries are often unclear[2]; although English speakers agree that *balcony* has a syllable boundary after *bal*, the syllable boundary in *balance* falls neither after *ba* nor after *bal*. Anderson and Jones[2] would represent the first syllable as [*bal*], the second as [*lance*], the whole word as [*ba*[l]*ance*]; the 'l' properly belongs to both the first and the second syllable. Segments which belong to two syllables at once are said to be ambisyllabic; below, we shall use [C] to represent an ambisyllabic consonant.

Previous work[3], using French words, indicated that in language perception the syllable functions as an effective processing unit; incoming words are processed syllable by syllable. Mehler *et al.*[3] asked University of Paris students to listen to lists of unrelated words and to press a response key as fast as possible when they heard a specified word-initial sequence of sounds. This target was either a consonant–vowel (CV) sequence such as *ba-* or a consonant–vowel–consonant (CVC) sequence such as *bal-*. The words which began with the sequence had one of two syllabic structures: the initial syllable was either open (CV), as in *balance*, or closed by a consonant (CVC), as in *balcon*. They found that response time was significantly faster when the target sequence corresponded exactly to the initial syllable of the word than when the target sequence was equal to more or less of the word than the initial syllable. Thus, the response to the target *ba-* was faster in the word *balance* than in *balcon*, while the target *bal-* was responded to faster in *balcon* than in *balance* (see Fig. 1*A*).

This syllabification effect has also been demonstrated in many other studies by Mehler, Segui and colleagues, using a variety of experimental techniques[4,5]. Moreover, sensitivity to the syllable as a unit seems to be natural for pre-linguistic infants[6], which suggests that it may be a characteristic of the human language processor, independent of particular languages.

Perceptual strategies such as syllabification have presumably been developed because they can speed up the recognition of words. We do not know, however, whether this particular strategy would be as efficient for English as it appears to be for French. Because ambisyllabicity is prevalent in English, and syllable boundaries are therefore hard to identify, it is likely that syllabification would frequently prove difficult, so that it would tend to make the comprehension process less rather than more efficient. Therefore, we replicated the study of Mehler *et al.*[3] using English material, and English-speaking subjects. Twenty-four students at the University of Sussex listened for either CV or else CVC targets in lists of isolated words; the target-bearing words' initial syllables had either CV[C] (for example, balance) or CVC (for example, balcony) structure. The results are presented in Fig. 1*B*; clearly, the response time to CV and CVC targets was not significantly different either in CV[C] or in CVC words.

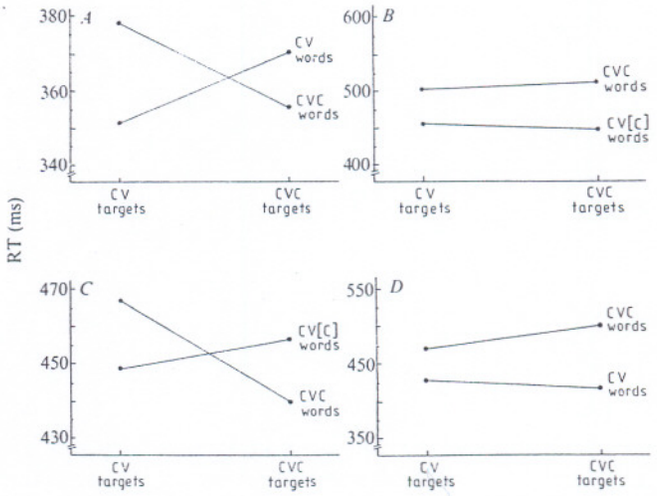

Fig. 1 Mean target detection response time (RT) as a function of size of target sequence (CV, for example, *ba-* versus CVC, for example, *bal-*) and size of initial syllable of stimulus word (CV versus CVC for French; CV[C] versus CVC for English), for the following permutations of subjects' native language and stimulus presentation language. *A*, French subjects and words; *B*, English subjects and words; *C*, French subjects, English words; *D*, English subjects, French words.

Thus, the structural difference between French and English seems to be reflected in a difference in the way in which the two languages are processed. The syllabification strategy works efficiently in the perception of French, because French is easy to divide into syllables; hence, the syllabification strategy is used by French listeners. English, however, is hard to syllabify, so that such a strategy would be highly inefficient in perception; and indeed, English listeners do not use it. Our results appear to show, therefore, that human listeners use different processing strategies with different languages.

The question then arises of whether such strategies are characteristic of the perceiver (that is, will syllabification be used by French listeners but not by English listeners irrespective of input language?), or whether they are imposed by the characteristics of the speech material (that is, will syllabification be used in the perception of French but not of English irrespective of the perceiver's native language?).

Therefore, we conducted two further experiments in which the subjects' native language and stimulus presentation language differed. Twenty-four University of Sussex students, with only rudimentary knowledge of French, performed the sound sequence detection task on the French material used in the study of Mehler *et al.*[3]. The results (see Fig. 1*D*) showed that the performance of the English listeners hearing French material was strikingly similar to that of English listeners who had listened to English material in the previous study. Similarly, when the material from the English-language study was presented to 20 University of Paris V students who were not fluent in English, the performance of these subjects was strikingly similar to the performance of the French listeners who had heard French material in the Mehler *et al.* study (see Fig. 1*C*),

despite the fact that the language material did not in this case lend itself to the syllabification strategy.

We conclude, therefore, that the syllabification strategy is characteristic of listeners rather than of stimulus language. We suggest that listeners who have acquired French as their native language have developed the syllabification procedure, natural to the human language processing system, into an efficient comprehension strategy. On the other hand, listeners whose native language is English, where this strategy would not necessarily achieve greater comprehension efficiency, have not included syllabification in their repertoire of processing strategies. Further, we suggest that syllabification is only one of a range of possible strategies which the newborn brain has the potential to acquire; whether or not a particular strategy is incorporated in the developing language user's comprehension system will depend on the degree to which the structure of the language being acquired encourages the use of the strategy in question.

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