

Language-universal versus language-specific properties in speech perception

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The activation and competition of word candidates are central processes of spoken word recognition and have been implemented by models of speech perception. Previous research has identified many cues to word boundaries that can effectively modulate the activation of competing candidates and help segment the incoming speech. These cues, such as allophonic details, phonotactic constraints or metrical structure, depend on language specific properties. Some recent theories, however, suggest segmentation strategies that are universal and do not hinge on language specific features.

The Possible Word Constraint (PWC) discovered by Norris, McQueen, Cutler and Butterfield (1997) appears to be such a universal strategy. According to this constraint, words enter into an activation and competition process in a way that lexical parses including impossible words, not being syllables, are disfavoured. Thus, single consonants, because they don't constitute syllables, are not considered as appropriate parsing units and will not be treated as viable residues of the input. This applies in a universal manner, and the actual lexical status of words in a specific language is not relevant (Norris et al., 2001). The PWC has been confirmed in previous studies with languages such as English, Sesotho, Japanese, Cantonese and Dutch.

Using a word-spotting paradigm (Cutler & Norris, 1988), this study tested the predictions of the PWC on German and Slovak. Slovak is a language where single consonants, such as /g/ and /f/ (allophones of *k* (to) and *v* (in)) for example, are actual words, but cannot be syllable peaks. In German, single consonants do not constitute words. Three word-spotting and four control experiments investigated whether Slovak and German listeners follow the universal principle and reduce word activation in a single consonant context. If the PWC is indeed a language universal, then Slovak listeners should - just like Germans - find it more difficult to leave a single consonant stranded as compared to a syllable.

German listeners were significantly faster at spotting a target (e.g. *Rose* (rose)) in a nonsense string when the preceding context was a syllable (e.g. *suckrose*) than when it was a single consonant (e.g. *krose*), as predicted by the PWC. The results from a parallel Slovak experiment showed the opposite pattern. Thus, target (e.g. *ruka* (hand)) detection was significantly faster in a prepositional context (e.g. *gruka*) as compared to the syllable context (e.g. *dugruka*) and the non-prepositional context (e.g. *truka*). Two control lexical-decision experiments ruled out the possibility that the observed differences could be attributed to different acoustic realisations of the targets over conditions. A third word-spotting experiment with cross-spliced targets controlling for stress variations replicated the main finding for Slovak: The latencies in the prepositional context were faster than in the other two contexts. The RTs in the syllable condition were now also faster than in the non-prepositional condition, consistent with the PWC and supporting the role of fixed stress on segmentation in Slovak. Using the syllabification reversal task (Treiman & Danis, 1988), two further control experiments showed that the

syllabification strategies during speech processing play an important role, but they cannot reliably explain the differences in detection latencies between the prepositional and syllable as well as non-prepositional condition in the Slovak study.

Overall, the results support the universal tendency to treat syllables as possible parsing units. However, language specific properties associated with the lexical status of single consonants also seem to affect the activation and competition of word candidates. An alternative account capturing the available data will be discussed.

References

Cutler, A., Norris, D. (1988). The role of strong syllables on segmentation for lexical access. *Journal of Experimental Psychology: Human Perception and Performance*, 14, 113-121.

Norris, D., McQueen, J.M., Cutler, A, Butterfield, S. (1997). The possible-word constraint in the segmentation of continuous speech. *Cognitive Psychology*, 34, 191-243.

Norris, D., McQueen J.M., Cutler, A., Butterfield, S., Kearns, R. (2001). Language-universal constraints on speech segmentation. *Language and Cognitive Processes*, 16, 637-660.

Treiman, R., Danis, C. (1988). Syllabification of intervocalic consonants. *Journal of Memory and Language*, 27, 87-104.