

Event-related potentials as evidence for a constraint based analysis of foot structure and foot parsing

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In a series of EEG experiments on German word stress we have found neurolinguistic evidence for the foot as part of the prosodic hierarchy (Domahs et al., 2008; Knaus, Wiese & Janßen, 2007). Participants were presented with German words exhibiting different stress patterns and an odd number of syllables. The words were either presented with their correct stress pattern or with an incorrect one, i.e. the position of word stress was manipulated (e.g. *Bikini*, *Bikini*) or not (e.g. *Bikini*).

The results of these EEG-studies show that the perception of violations of word stress depends to a large extent on the underlying foot structure of a word. In cases where stress shifts result in a change of foot structure, a characteristic change in brainwave potentials was observable, i.e. a positive shift that was time-locked with the perception of a prosodically prominent syllable. Changes in the prosodic structure of a word were reflected by divergent brainwave potentials (Event-related Potentials, ERPs). These effects are only explainable if some intermediate prosodic level between the syllable and the word is assumed.

Overall, the experimental results provide us with independent external evidence for foot structure and foot parsing apart from the well known insights that language typology has provided.

In the present paper, it will be shown how the experimental outcomes can be modeled in an OT-analysis of German word stress which is based on the prosodic category foot, and how this new information can help to determine which constraints interact in a rather complex metrical system such as the one at work in German. In particular, we will discuss the role of PARSE-SYLLABLE and RIGHTMOST (Prince and Smolensky, 1993/2004) and their influence on extrametricality. For example, it can be concluded from the experimental findings that final syllables in German words with antepenultimate stress are not extrametrical (as other analyses suggest, e.g. Féry 1998).

Furthermore, we found evidence for single factors that have an influence on the construction of foot patterns: The experimental results speak in favor for a strictly binary foot form, which has to be mirrored in an OT-model by a high ranking of the constraint FOOTBINARITY (Prince and Smolensky, 1993/2004). Ternary foot structures cannot explain the findings of our EEG-studies and raise problems for proposals arguing for more complex foot structures (e.g. Hyde 2001).

Finally, we can also make predictions about how the exhaustive parsing of syllables into feet must be locally constrained and about the rhythmic type of feet in German which is expressed in OT-terms by the constraint RHYTHMTYPE (Prince and Smolensky, 1993/2004).

References

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