**The Incremental Processing of Pitch Accents, Information Status and Focus**

Stefan Baumann[1] and Petra B. Schumacher[2]
[1]*IfL Phonetik,* [2]*IDSL 1, University of Cologne, Germany*

The present study investigates the real-time comprehension of items in *First Occurrence Focus* (FOF), *Second Occurrence Focus* (SOF) and *Background* (BG) and their specific prosodic marking in German using event-related potential (ERP) measures. While previous electrophysiological research tested mismatches between prosody and information structure (e.g. [1]), our study assessed contextually licensed, appropriate prosodic realizations.

Crucially, the setup of our study makes it possible to tease apart the independent contributions of focus (defined here morpho-syntactically by a focus particle) on the one hand and information status (here: newness vs. givenness) mediated by context on the other. The three combinations of focus and information status tested also come with distinct prosodic realizations, as previous studies suggest (e.g. [2] show that SOF elements are often marked by phrase accents, i.e. postnuclear prominences expressed by increased duration and intensity but not by tonal movement). Weighting procedures with factors that have a 'boosting' or an 'inhibiting' influence on an element's prominence have been proposed (e.g. by [3]), assuming the relevance of three distinct levels of prosodic prominence that mirror three distinct levels of information structural weight or importance. (1) translates this relation into a system of binary features.

(1)

| Information structural importance | | Prosodic prominence |
|---|---|---|
| FOF (+focus, +new) | increase ↑ | Pitch accent (+pitch, +duration) |
| SOF (+focus, -new) | | Phrase accent (-pitch, +duration) |
| Background (-focus, -new) | | No accent (-pitch, -duration) |

Forty stimuli per condition were created as part of the answer of a mini dialogue (see examples with the target word *Bier* 'beer' in (2)) and read by a trained phonetician. The stimuli (plus 120 filler dialogues) were presented to 21 native speakers of German (17 w, 4 m) in an ERP experiment. A word recognition task served to test participants' attention to the stimuli. Based on previous ERP research, we predicted increasing processing demands with increasing informational importance and decreasing prosodic prominence [4]. This was widely confirmed.

The manipulation of ***information structure*** revealed increased processing effort over posterior brain regions for FOF items, reflected in a more pronounced negativity between 400 and 650 ms (FOF > SOF/BG; see Fig.1). This supports previous studies (e.g. [4, 5]) and can be attributed to [+new] rather than [+focused] information, i.e. the divide of FOF vs. SOF/BG is between new and given and not between focused and non-focused information.

As to ***prosody***, our results indicate an inverse relation between processing effort and the level of perceived prominence: We found a clear difference over anterior brain regions between the processing of pitch accents (displayed in FOF contexts), which are prosodically prominent due to tonal movement in the vicinity of a stressed syllable, and no pitch accents (comprising phrase accents and deaccentuation in SOF and BG contexts), which lack this tonal movement. This difference was reflected in a biphasic pattern, i.e. a negativity between 250 and 400 ms followed by a positivity between 750 and 950 ms for SOF/BG over FOF. Since increased processing effort is only observed for lack of accents, we assume by implication that the production of a pitch accent, which is more costly for the speaker, reduces the processing costs on the side of the listener. An intermediate status of phrase accents in terms of processing effort and, in turn, prominence perception could not be confirmed.

In conclusion, our data indicate that prosodic and information structural cues influence incremental processing in discrete ways and that pitch accents and newness fulfill specific prominence-lending functions.

(2)

**FOF**

Context: Was gibt's Neues? ('What's new?')

Target: Karl hat nur **BIER**$_{FOF}$ getrunken. ('Karl only drank BEER.')

**SOF**

Context: Eva hat nur Bier getrunken. ('Eva only drank beer.')

Target: Sogar THOmas hat nur **BIER**$_{SOF}$ getrunken. ('Even THOmas only drank BEER.')

**BG**

Context: Wer hat Bier getrunken? ('Who drank beer?')

Target: HANS hat **Bier**$_{BG}$ getrunken. ('HANS drank beer.')

Target words printed in bold face; Capitals indicate fully-fledged (nuclear) pitch accents, small capitals mark phrase accents, and lack of capitalisation indicates complete lack of prominence.

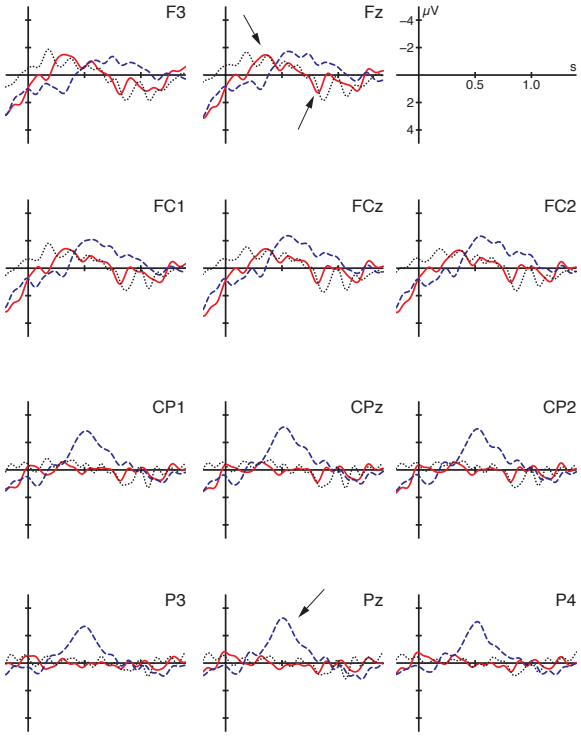


Figure 1. *Grand-average ERPs at selected electrodes for the contrast BG (red solid line) vs. SOF (black dotted line) vs. FOF (blue dashed line), time-locked to the onset of the critical word.*


[1] Toepel, U., Pannekamp, A., & Alter, K. 2007. Catching the news: Processing strategies in listening to dialogs as measured by ERPs. *Behavioral and Brain Functions* 3, ARTN 53.

[2] Beaver, D., Clark, B., Flemming, E., Jaeger, F., & Wolters, M. 2007. When Semantics Meets Phonetics: Acoustical Studies of Second Occurrence Focus. *Language* 83(2): 245-276.

[3 Beaver, D., & Velleman, D. 2011. The Communicative Significance of Primary and Secondary Accents. *Lingua* 121: 1671-1692.

[4] Baumann, S., & Schumacher, P. B. 2012. (De-) accentuation and the processing of information status: evidence from event-related brain potentials. *Language and Speech* 55(3): 361-381.

[5] Burkhardt, P. 2006. Inferential bridging relations reveal distinct neural mechanisms: Evidence from event-related brain potentials. *Brain and Language* 98(2): 159-168.