



The Phonetics of Emphasis

Klaus J. Kohler & Oliver Niebuhr

Institute of Phonetics and Digital Speech Processing (IPDS), University of Kiel



WHAT IS EMPHASIS?

Making utterance sections salient for functions of communicative highlighting

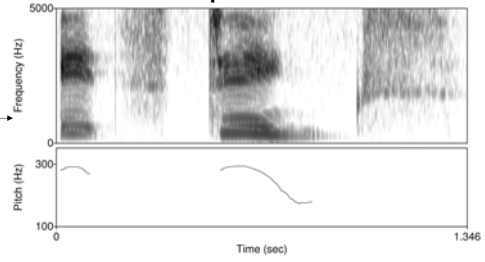
• salience

- primarily phonetic, especially prosodic
- but also lexical and syntactic, e.g. by syntactic fronting
she's a good cook. an excellent cook is Alice!
- further supported by facial expression and gesture

• communicative highlighting

- information selection** – propositional highlighting of certain words (narrow focus)
 - **factual singling out** – pitch accent on salient word, deaccentuation around it
Peter invited a few of his friends to a party in his flat.
ANNA came with MANNY.
 - **importance weighting** – f0 range
Manny was there too. He came with ANNA.
 - **insisting (reinforcement, correction)** – initial consonant strengthening + pitch features
no, MARY came with Manny; 'accent d'insistance' in French
- contrast to one's expectation**
 - **degree of affective evaluation** – medial to late f0 peak synchronization
He used to be SLIM.
- expressive intensification** – special prominence for amplification of verbal meaning
 - **positive, expression of pleasure** – strengthening sonorous features of accented syllable?
It's deLicious. (Fig. 1a)
 - **negative, expression of dislike** – weakening sonorous features of accented syllable?
It STINKS! (Fig. 1b)

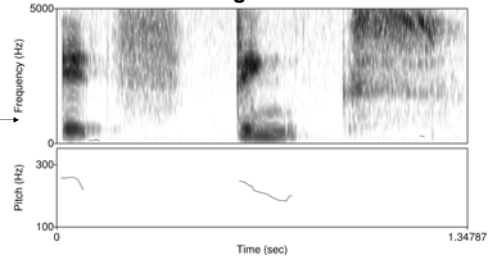
'It STINKS' – positive intensification



(a)

Figure 1: Spectrogram and F0 of 'It STINKS' with (a) positive (b) negative expressive intensification; female speaker

'It STINKS' – negative intensification



(b)

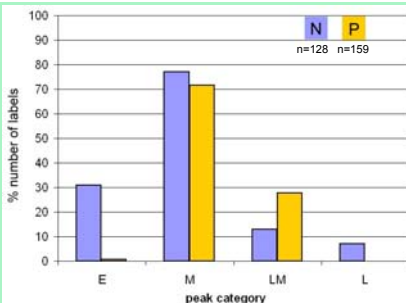


Fig. 2: distribution of German intonation peak categories across P, N emphasis

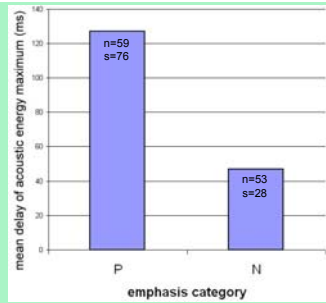


Fig. 3: mean delay of acoustic energy maximum after acc. vowel onset for P, N emphasis

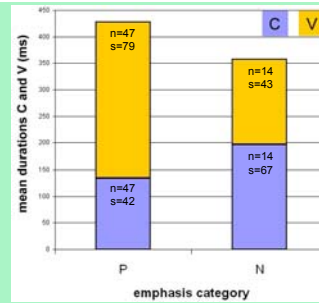


Fig. 4: mean durations of C and V in the acc. syllable for P, N emphasis

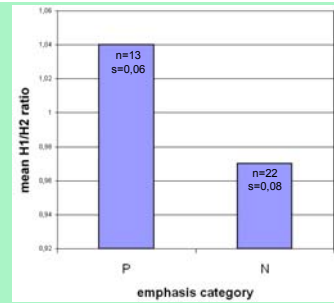


Fig. 5: mean H1/H2 amplitude ratio in the accented vowel for P, N emphasis

INVESTIGATING EXPRESSIVE INTENSIFICATION IN GERMAN

Data acquisition

- **written texts**
 - in situational and linguistic contexts
 - with target words chosen according to semantic, pragmatic and phonetic criteria
- **elicitation through reading the texts**
 - in monologues for **positive (14)** or **negative (15)** intensification with support of photos of the corresponding facial expressions
 - in 8 dialogues for **weighting** and **intensification**
- **speakers**
 - pairs of extrovert speakers knowing each other well, one male, one female
 - sitting face to face at a table
 - to read their parts of the dialogues
 - or for one speaker to read the monologues while the other listened
- **recording**
 - the session of a speaker pair contained the sequence
 - reading of the 8 dialogues from prepared sheets
 - each speaker reading the two sets of monologues
 - reading of the 8 dialogues again with reversed roles
 - instruction to read each dialogue as often as necessary until they both judged it natural
 - monologue productions also judged and repeated until satisfactory version was reached
 - the complete practice and test sessions were recorded
 - stereo recording with direction microphones, one for each speaker, placed in front of them
 - 4 pairs of speakers from North Germany (3 in their 30s, 1 in their 60s)

Data labelling and data analysis

- **prosodic labelling**
 - with xasp and KIM-based PROLAB
 - guided by function, not by phonetic properties
 - didirion of the prosodic labels **P** and **N** for positive and negative intensification
- **search operations** in the prosodically labelled database
 - for the labels **P** and **N**, all associated with peak contours
 - for peak synchronization markers *early E*, *medial M*, *late medial LM*, and *late L*
- **physical measurements**
 - time-span of acoustic energy reaching maximum after accented-vowel onset in corresponding **P** vs. **N** words
 - durations of **C** and **V**, as well as the ratio **C/V**, in the syllable structures **C + V(long,diphthong) + any coda** of **P** and **N** words
 - formants **F1**, **F2**, and ratio of the first two harmonics **H1/H2** in **P**, **N** words containing */a:/* or */a/*

Results

- **overall frequencies:** 159 cases of **P**, 128 cases of **N**
- **distributions of the 4 synchronization categories:** Figure 2
 - peaks are synchronized *non-early* for **P**, *non-late* for **N**: highly significant (chi2)
 - **P** marked by rising pitch into the accented vowel to a high F0 level, **N** by falling pitch to a low F0 level
- **timing of the acoustic energy maximum:** Figure 3
 - later after accented vowel onset in **P** than in **N**: highly significant (*t* test for independent samples)
 - acoustic energy is intensified in accented syllable nucleus for **P**, in onset for **N**
- **duration ratio C/V and durations of C and V:** Figure 4
 - duration ratio smaller for **P** than for **N**
 - **C** shorter for **P** than for **N**
 - **V** longer for **P** than for **N**
 - all three measures significant (*t* tests for independent samples)
 - onset consonant and vowel nucleus affected bidirectionally: negative emphasis lengthens the initial consonant and shortens sonorous nucleus, positive emphasis has opposite effect
- **formants F1 and F2 and H1/H2 ratio:** Figure 5
 - formants do not differ between the two sets
 - ratio larger for **P**, pointing to steeper spectral tilt and breathier voice: significant (*t* test for i. s.)

DISCUSSION

- Acquisition procedure generated natural, albeit acted, expressive speech by non-actors. It may be adopted as an efficient way of eliciting different types of emphasis systematically.
 - In some cases, pre-defined positive/negative intensification implemented by other functions
 - rarely negative intensification used in the positive contextualization or vice versa
 - inadequate rendering in the specific context
 - irony, with verbal and prosodic meanings clashing and prosodic meaning winning.
- Investigation allowed to pinpoint a set of differentiating features for **P** and **N** emphasis
 - pitch, energy, and duration patterns converge in intensifying
 - the nucleus of the accented syllable by lengthening, and by rising, high pitch for **P** emphasis
 - the beginning of the accented syllable by lengthening the consonantal onset at the expense of the nucleus, followed by falling, low pitch in the nucleus for **N** emphasis
 - validation by formal perception experiments in which ordinary listeners allocate systematically manipulated stimuli to the set of emphasis category labels.
- **P** strengthens, **N** weakens sonorous features
 - **P** tends to have soft breathy voice as against tight voice phonation in **N**
- The paradigm should be applied to other languages, on the hypotheses
 - that the characterization of **P** and **N** emphasis occurs frequently, certainly in English
 - that it may be a language universal.