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1 Introduction and overview

Information transfer in interpersonal communication is not arbitrary but highly structured. When people communicate, they connect their current utterances with the ones they expressed before. Moreover, utterances are adapted to the preceding discourse of interlocutors. Due to these inherent interconnections, analyses by means of the traditional linguistic branches (i.e. phonology, semantics, morphology, and syntax) are insufficient to describe the structure and meaning of utterances as they often do not correspond to syntactic phrases or single sentences.

Thus, a description level must be employed which incorporates properties of all linguistic disciplines. Halliday (1967) put forward the notion of *information structure* to account for the organisation of utterances into "information units" (p. 200). Within the broader framework of *information structure,* descriptions are provided of how speakers` intentions are realised in discourse, and of how these become perceivable by recipients. A considerable part of this framework is concerned with the question how *novel* or *contrastive* as opposed to *given* information is conveyed between interlocutors. One of the notions for novel and contrastive discourse information is *focus* (Lat. *fire place*), a term around which the complete thesis at hand is centred.

The notion of focus is also present in the psychological literature. It is then defined in terms of selective attention to a certain stimulus (Winn, 2001). Thus, linguistics and psychology do not employ the term *focus* analogously but in a somehow consistent way. In brief, one could say that the linguistic means to focus marking serve to attract the interlocutors` attention to novel or relevant discourse information.

German, as the language to be examined in this thesis, provides several opportunities to realise a focus in discourse. In the following chapters, two of these opportunities are particularly referred to: *pragmatic* and *prosodic* means to focus marking. *Pragmatic foci* are derivable from the context of an utterance. They incorporate the information that is not shared so far between interlocutors. *Prosodic focus* markings (accentuation), on the other hand, are usually employed by speakers to highlight sentence elements by intonational means. Usually, it is the pragmatically focussed information which is prosodically highlighted by speakers. However, listeners are often faced with communication instances in which speakers produce inappropriate prosodic focus markings. Thereby, speakers` failure can be at least two-fold. Information can receive a focus accent although it is neither new nor

relevant for the listener. Moreover, speakers sometimes `forget` to highlight that upcoming information is new or relevant for the interlocutor.

The present work aimed at examining the relevance and interplay of prosodic and pragmatic focus information during the on-line processing of context-embedded utterances. For this reason, the experimental methodology of event-related potentials (ERPs) was employed. In particular, the Closure Positive Shift (CPS) was investigated as to its relevance in information structural processing.

Previous research has so far proven the reliance of the CPS on prosodic phrasing in the processing of sentences without context information (Steinhauer, Alter, Friederici, 1999; Pannekamp, Toepel, Alter, Hahne & Friederici, 2005). For the elicitation of the CPS in context- or discourse embedded utterances, however, the data are still rare (Hruska, Alter, Steinhauer & Steube, 2001). The study of Hruska et al. showed that the CPS in discourse processing is not induced by the prosodic phrasing but when listeners perceive focus positions. However, when the pragmatic and prosodic means to focus marking are in conflict the data are not unequivocal. Partly, the CPS is then elicited in response to the pragmatic focus or results in an electrophysiological mismatch deflection with negative amplitude.

Thus, the work at hand explores the inducing factors of the CPS in differing information structural settings. Moreover, the consequences of processing non-matching pragmatic and prosodic information are investigated in detail.

Overall, four experiments were conducted which examined the prosodic realisation (accentuation patterns) and the processing (by means of behavioural and ERP data) of focus as opposed to non-focus information in German dialogue conversation.

Experiment I (chapter 4) explored the intonational realisation and the perceptual consequences of correction focus as opposed to novelty focus in dialogues. The acoustic and phonological analyses showed that correction focus is realised as a highly salient falling H*+L accent while novelty focus was realised as a rising L*+H accent.

With respect to the ERP data, the elicitation of the CPS was attributable to the perception of every contextually defined (pragmatic) focus position but independent from the actual prosodic realisation of the focus. However, novelty accentuation on pragmatic correction foci evoked an additional centro-posterior negative ERP.

Experiment II (chapter 5) evaluated the prosodic properties and perceptual consequences of correction focus as opposed to novelty focus in further extended dialogues. In congruence with Experiment I, the acoustic and phonological analyses ascertain the realisation of corrections with a salient falling H*+L accent, and the pattern on novelty focus as an L*+H accent.

The ERP data confirmed that CPS responses were associated with the perception of each pragmatic focus position but independent from the actual prosodic realisation of the contextually constrained foci. Moreover, a centro-posterior negative ERP was induced when pragmatic correction foci were prosodically realised as novelty focus.

Experiment III (chapter 6) served to exlore whether the contrastiveness of discourse information is per se sufficient to elicit the CPS. For this purpose, the production and perception of correction focus was opposed to contrastive topic information. The acoustic and phonological analyses displayed highly salient accents for both information types. However, the correction accent revealed a falling H*+L accent while the i-topic was realised as a rising L*+H accent.

The ERP data indicate that the CPS is not elicited to the perception of contrastive information per se but only to contrastive information in pragmatic focus positions. Moreover, no ERP deflections are induced when the contrastive focus accent and the contrastive topic accent are interchanged.

Experiment IV (chapter 7) serves to complete the picture on the nature of the CPS in discourse perception. Thus, the production and perception of correction focus was opposed to contextual givenness. The acoustic and phonological analyses affirm the realisation of corrections as a falling H*+L accent while contextual givenness is produced with a low montonal L* accent.

The ERP data show that the absence of pragmatic foci in a dialogue induces an alteration of the employed processing mechanisms. Listeners then display the CPS when major prosodic bundaries are encountered. Thus, the elicitation of the CPS in context-embedded utterances without pragmatic foci is in congruence with the meachanisms employed for the structuring of context-free utterances (Steinhauer et al., 1999). In addition, negative ERP deflections are exhibited when pragmatic correction foci are realised with the accentuation of givenness.

Before detailed descriptions of each experiment are provided, the overall theoretical background of the current work will be introduced (chapter 2). In chapter 3, the experimental methodology and the general design of all experiments are illustrated in detail.

In the last part of the thesis (chapter 8), all experimental results of Experiment I-IV will be summarised and discussed.

2 Theoretical background

The term *prosody* is used to describe linguistic and paralinguistic properties inherent to spoken language. Thereby, linguistic prosody captures, inter alia, the course of a sentence melody (which determines e. g. whether an utterance is a question or a statement) but also which characteristics make out a certain spoken sound (e. g. the number of vocal fold vibrations per second). Thus, the domains of analysis differ substantially between a single sound and the melodic contour of a whole sentence. In addition, various theoretical and practical ways of the analysis of prosody do exist. So far, there is no consensus so far as to a universal standardised definition of the term *prosody.* However, it is generally assumed that prosodic units (e.g. syllables or prosodic phrases) are often larger than one segment or phoneme of a language. Due to that, the term of *suprasegmental or prosodic phonology* is often used in a similar way than the term *prosody*.

2.1 Accentuation and prosodic phrasing within sentences

Several authors (Selkirk, 1984; Nespor & Vogel, 1986; Hayes, 1989) have presented models for the hierarchical organisation of suprasegmental units. The underlying concepts differ slightly in their chosen terminology and the constituting units but not with regard to the hierarchical order of the considered levels. A stylised model for German looks as follows (see also Shattuck-Hufnagel, 1996: 206):

Utterance

↓

Intonational phrase (IPh)

↓

Phonological/ Intermediate Phrase (PPh)

↓

Clitic Group (CG)

↓

Phonological Word (PW)

↓

Foot (F)

↓

Syllable (σ)

In particular, the accentuation patterns of syllables as well as Phonological Phrases (PPh) and Intonational Phrases (IPh) will be considered in the following. The hierarchical levels between syllables and phrases are of minor importance for the present work.

The main parameters of linguistic prosody on phrase level (Cruttenden, 1996; Ladd, 1996) can be subdivided with respect to their local or global effects on the realisation and perception of speech. These main properties are thereby (following Mayer, 1997: 15)

- The fundamental frequency (F0)
  - F0 *locally* varies intrinsically between phonemes and phones (as a function of their sonority).
  - Its *local* fast variation is being perceived as pitch accent and terminal tone of a prosodic phrase.
  - F0 *globally* shows the register and pitch employment of a speaker.
  - It is *globally* the subject to declination.
- The duration
  - It is *locally* manifested by lengthening or shortening of segments and the length of pauses in the speech stream.
  - Duration *globally* shows the speed of communication and its rhythm.
- The intensity
  - It *locally* varies inherently between segments (as a function of their sonority).
  - It is perceived *globally* as loudness.

In German, Dutch, and English as accent-counting languages (Pike, 1945; Abercrombie, 1967) the relevance of these prosodic parameters on phrase and

sentence level mainly lies in the encoding of prominence (accentuation), and in subdividing utterances. Moreover, the accent-counting languages have been attributed an ostensible employment of F0 movements and duration factors (syllable lengthening and pauses in the speech signal) for the marking of prominence (Cooper, Eady & Mueller, 1985; Wells, 1986). For the phonological annotation of prominence and phrasing within utterances many researchers make use of an annotation system based on the Tone-Sequence-Model (TSM; Pierrehumbert, 1980). This model was termed ToBI (Tone and Break Indices) and was based on the description of American English first.

Meanwhile, this model has been adapted and modified for the description of German intonation as well. Its English name was adopted, and is now *German Tone and Break Indices* (*GToBI*; Grice & Baumann, 2002). It enables the coding of accents, terminal tones, and pauses by the employment of several description levels.

In the following, the main aspects of the Grice & Baumann (2002) model will be introduced as it will be employed for the description of the prosodic properties of the speech materials at hand (see section 3.3.1).

The GToBI system postulates two underlying tones, namely high (H) and low (L). Tone movements in the F0 are represented by combinations of high and low tones. Regarding the notation of monotonal accent positions, either an H* or L* is assigned to the lexically stressed syllable (the head) of a lexeme. More complex accent pattern (e.g. bitonal) which manifest in form of tone movements on a lexeme or even within a syllable (as in contour tones) are represented by combinations of an asterisk head with a preceding (leading) or following (trailing) tone (e.g. L*+H, L+H*).[1]

The annotation of accents in GToBI therefore incorporates processes of lexical phonology (by taking into account lexical stress), and post-lexical processes (describing accentuation on phrase and sentence level).

However, it is not sufficient to consider the accent properties of prosodic phrases only. Thus, the GToBI system also incorporates annotations for the boundaries at the right edges of prosodic phrases.

For the representation of phonological phrase (PPh) boundaries a "-" (minus) is attached to the respective tone H or L. These tonal realisations are termed *phrase*

[1] The systems of Gussenhoven (1983a) and Féry (1993), however, do only assume left-headed (asterisk) structures, and do not allow for leading tones.

accents (H- or L-). This rather ambiguous name is due to the fact that phrase accents are not only manifestations of PPh boundary tones but can also be associated with tone-bearing units preceding the actual boundary tone. Thus, they often determine the intonation contour from the last accent of a Phonological phrase up to its right boundary.

Boundaries of Intonational phrases (IPh), on the other hand, are realised discretely on the final syllable of a phrase and often as local tone movements. They are labelled in GToBI with a "%" (percent) diacritic at the respective high or low tone (H% or L%) of Intonational phrases (IPh). Each IPh boundary appears in congruence with a PPh boundary.

If one IPh is followed by another IPh within one sentence its boundary tone is often realised as a high tone (H%). This pattern is known as *continuation rise* (Pierrehumbert & Hirschberg, 1990: 305) as it then signals the persistence of the utterance by the following IPh. Furthermore, the H% tone can also indicate the interrogative mode of a sentence (for yes-no-questions in English: Pierrehumbert & Hirschberg, 1990: 306; for German: Féry, 1993: 68f.; Uhmann, 1991).

Additional cues to the prosodic structuring of utterances are provided by the F0 excursion. Within one prosodic phrase the excursion of F0 (relative to its speaker-specific global range) normally decreases towards the end. Most often, Phonological phrases (PPh) are described as the domains of application for this phenomenon termed *declination* or *downstep* (Ladd, 1983; Beckman, 1986). In the beginning of a new PPh the F0 is subject to resetting then. Nevertheless, there is also some evidence for the IPh as application domain of declination (Shattuck-Hufnagel, 1992; Shattuck-Hufnagel, Ostendorf & Ross, 1994).

Thus, the direct boundary-constituting parameters of prosodic phrases are in general quite variable and hard to define unequivocally (Cruttenden, 1986: 35ff.; Féry, 1993: 59 ff.).

For the definition of the status of prosodic phrase boundaries as IPh or PPh some additional factors apart from the F0 contour are explored in the current work. In particular, prefinal lengthening seems to be a quite stable parameter for IPh boundary marking (Lehiste, 1973; Ladd & Campbell, 1991). This phenomenon becomes apparent in the syllable durations before IPh boundaries. Furthermore, optional pauses are hints to the hierarchical categorisation of a prosodic phrase as Phonological (PPh) or Intonational (IPh) as they mainly occur between IPh`s.

Accordingly, prosodic boundaries in the speech materials at hand (see section 3.3.1) are annotated as IPh boundaries when the following criteria are fulfilled. A discrete local boundary tone is evident on the last syllable preceding the proposed boundary, this very syllable displays prefinal lengthening, and the F0 is reset after the proposed boundary. Pauses, however, are only treated as secondary cues as they are optional manifestations.

As a summary, a short overview of the supposed accentuation and boundary patterns for the current work on German is given below. The particular impact of the certain accents on listeners` interpretation of utterances is laid out in section 2.4.

- Phrase accents at PPh boundaries: L-, H-
- Boundary tones of IPh: L%, H%
- Monotonal accents: L*, H*
- Bitonal accents: L+H*, L*+H, H+L*

In addition to the bitonal accents presumed by GToBI (L+H*, L*+H, H+L*), the existence of an H*+L accent (see also Pierrehumbert, 1980) is proposed for German intonation. Previous work of Féry (1993) and Uhmann (1991) relate this accent pattern to the prosodic contrastive realisation of focus in German (see section 2.4).

2.2 Syntax and prosodic phrasing

The boundaries of Phonological phrases (PPh) show the best correlations with boundaries of major syntactic phrases (Nespor & Vogel, 1986; see also Hirst, 1993). On the other hand, the structure of Intonational Phrases (IPh) is hard to describe on syntactic grounds. The existence of at least one accent is an essential criterion for the constitution of a Phonological (PPh) as well as an Intonational phrase (IPh). When more than one accent is existent within one phrase, one of them is termed *nuclear accent*. Additional accents are defined as pre- or postnuclear accents.

The assumptions of generative theories predicting the position of the nuclear accent based on syntax differ in their statements about the position of the nucleus within a prosodic phrase. For example, Chomsky und Halle (1968) developed the

“Nuclear Stress Rule” (NSR). They postulate that the nuclear accent is placed on the rightmost element in a sentence which can be accented. This means that in languages with a relatively fixed subject-verb-object (SVO) order (like English) the main accent in neutral context-free utterances is placed on an argument of the verb.

However, in languages with an underlying word order of subject-object-verb (SOV; like German and Dutch) this rule leads to inadequate predictions since the verb would carry the nuclear accent in general. Cinque (1993) thus formulated a stress rule more independent from word order. According to Cinque, the nuclear accent carrier is the most deeply embedded argument. The “Null Phrase Theory of Stress Assignment” can therefore make predictions that are more independent from the underlying word order of a specific language.

In the following chapters, the statements about nuclear accent placement will thus be based on the assumptions of Cinque (1993). Hence, the most deeply embedded sentence constituents (here: direct objects) are treated as the syntactically determined nuclear accent carrier.

With respect to the opposite relationship, namely the function of prosody in the syntactic structuring of utterances, extensive research was and is being conducted (for an overview see Cutler, Dahan & van Donselaar, 1997). In particular, the role of pausing and syllable lengthening in the end of major prosodic phrases (e.g. Lehiste, 1973) has been shown to influence the disambiguation of temporally ambiguous sentences. Moreover, movements of the F0 towards the end of major prosodic phrases substantially contribute to the syntactic structuring of utterances (Warren, 1985) and to listeners` expectancies on the continuation of utterances (Warren, Grabe & Nolan, 1995). However, the prosodic influences on syntactic phrasing and the interpretation of context-free utterances will not be considered in the work at hand. Yet, it will become apparent in later sections that especially F0 movements play a decisive role for the structuring and interpretation of context-embedded utterances, too.

2.3 The information structure of spoken utterances - Notions of focus from different perspectives

The notion of focus describes the phenomenon of highlighting information within the communication process. Different branches of linguistics have developed descriptions of this phenomenon. In the following sections, a short overview of these theoretical assumptions is presented. Moreover, especially those works will be covered that include prosodic descriptions of focus or are concerned with accentuation phenomena of the focus positions within utterances.

The scope of focus within sentences has got direct implications for its interpretation. Utterances that are communicated without a preceding context or as answers to wh-interrogatives such as *"What happened?"* are interpreted as conveying information that is globally new to the listener. Ladd (1980, 1996) termed these instances *broad focus*. The accent placement in these sentences then corresponds to the rules described in the paragraph about intonational phrasing (2.2).

Expressions that appear in response to wh-interrogatives *("Who?", "Where?")*, on the other hand, imply that a listener has got previously exchanged knowledge about the theme that is talked about. These communicative instances then show a *narrow focus* on those sentence constituents asked for by the wh-element. Narrow focus within utterances overrules the regularities of broad focus accentuation and gives to accents on the sentence constituents asked for by a certain wh-question. The existence of a connection between accented words in a sentence and the question preceding this sentence has already been described at the end of the 19th century (Paul, 1880). Possible accentuation patterns and their implications for the interpretation of meanings are further specified in section 2.4.

Narrow foci can also be determined when parts of utterances are contrasted or corrected. While broad focus always incorporates information that is novel to the discourse, narrow focus information can either extend the topic of a discourse (hence, be novel) or not. Corrections, on the other hand, do not extend he discourse topic. This distinction, which is of great importance in the work at hand, is manifested in Kiss' concept of *informational* vs. *identificational* focus (Kiss, 1998).

Apart from the *correction* of a speaker's assertions, further *specifications* of assertions can also occur, e.g. in the form of contrastive topics. The exact

characteristics of correction focus and contrastive topics will be presented in detail in chapter 4 (corrections) and in chapter 6 (contrastive topics) as they are of major interest for this thesis.

However, first, three approaches to the phenomenon of focus are shortly illustrated. By this, special attention shall be given to the significance of contextual embeddings for the determination of focus, and, accordingly, its prosodic manifestations.

2.3.1 The phonological perspective

The characterisation of focus on phonological level has a long tradition within generative grammar. Chomsky describes the focus of utterances as a direct consequence of the underlying phonological structure since it is determined by "*the intonation centre of the surface structure*" (Chomsky, 1971: 201). Reinhardt (Reinhardt, 1995) also specified this view as *perspective of phonological form*.

The approaches presented in the next sections, however, do not claim that only phonological characteristics determine the focus of an utterance. In contrast to the phonological perspective, they assert that especially semantic-pragmatic or syntactic devices are relevant for focus assignment in communication.

2.3.2 The syntactic perspective

Generative linguistics usually assumes a simple focus feature [+F], which is in fact of semantic nature but operates on the surface representation of the syntactic structure (Jackendoff, 1972). This feature also determines the prosodic prominence of the sentence constituent associated with the focus feature (Jackendoff: *stress*) [1]. If the scope of the focus goes beyond the prominent constituent, a process called *focus projection* (Selkirk, 1984; 1995) comments to enlarge the domain of the focus. This process is subject to some restrictions. A syntactic phrase can only be regarded as part of the focus domain if its head is marked [+F]. Conversely the head of a phrase can be focus marked if one of its internal arguments is marked [+F].

[1] The notion of *stress* is quite irritating in this context. For reasons of consistency the widely accepted term *stress* is being used for word level prosody, and the terms *intonation or accentuation* are used when speaking about prosody on phrase level and beyond.

The special aspect of Selkirk's works is, however, that it considers intonational phrasing in addition to focussing. According to her opinion the intonated surface structure of a sentence presents an intermediary form, which functions as an input for the phonological interpretation and for the interpretation of meaning (in linguistic terms: for the *phonological and logical form*). This interim form is again the result of intonational phrasing and the assignment of (sentence) accents, which both take effect before focus accents are assigned.

Hence, Selkirk's works stands in sharp contrast with those works that only consider the sentence accentuation as the determinant of focus and thereby negate potential influences of intonational phrasing and syntactic-semantically driven focus assignment (Cinque, 1993; Reinhardt, 1995; Zubizarreta, 1998).

2.3.3 The semantic-pragmatic perspective – The role of context

Within the very influential Prague School the notion of a "*Functional sentence perspective*" has already been put forward by Mathesius (1929). This notion was understood as the structuring of an utterance with respect to its communicative function. Hence, there are discourse parts that are regarded as prosperous in information and others that are more or less redundant. Information that is known from a discourse is called the theme (Greek-Latin "*the already established*"). Contents that are introduced as new or re-introduced to the discourse are called the rheme (Greek "*the statement*").

Models of interpersonal communication have been developed since the beginning of the 1960s. They are essentially shaped by the "Speech Act Theory" by Austin (1962) and Searle (1969). The models basically postulate that the basis of interpersonal communication is not the single word or sentence but speech acts, the so-called illocutions. They manifest the intention of a speaker to produce a communicative effect.

Alternative notions to the theme/ rheme dichotomy are *given* vs. *new* information, *topic* vs. *comment* (Daneš, 1967), *background* vs. *focus* (Jacobs, 1988) and others. Theories also diverge with respect to a supposed bi- or tripartition of the information to be transmitted. A supposed tripartition would thus lead to the structuring of an utterance into background information, topic and focus. Nonetheless, not all of these structural levels must be present in each utterance (e.g. in broad focus utterances).

The notions of broad and narrow focus in my work strongly refer to Ladd (1980). "The structure of intonational meaning" by Ladd (1980) and several papers by Gussenhoven (1983a, 1992) form the basis of the *structure-based approach* to the description of focus (see Ladd, 1996). These works, along with the *salience-based approach* by Bolinger (1972) and Schmerling (1976), present the most influential works within the pragmatic views on focus incorporating assertions about intonation. The salience-based approach postulates that the distribution of focus and focus accents is determined by semantic and discourse factors (e.g., semantic predictability, relative informational content, and utterance context). In contrast, the structure-based approach assumes that the accent distribution within an utterance is determined by structural factors (e.g. the argument-predicate distinction) as soon as the focus is defined by a context and the speaker's intention.

2.4 The assignment and meaning of pitch accents: Assumptions based on autosegmental-metrical notations

In the present section, I will concentrate on the most influential approach developed for English intonation by Pierrehumbert & Hirschberg (1990), and the comment on it by Hobbs (1990). With special regard to the realisation of focus accents in German, the work by Uhmann (1991), Féry (1993) and Grice and Baumann (2002) will be reported[1].

Pierrehumbert & Hirschberg (P&H in the present section) developed a compositional model of intonational meaning incorporating assumptions by e.g. Bolinger (1982), Gussenhoven (1984) and Ward & Hirschberg (1985), and the Tone-Sequence-Model by Pierrehumbert (1980). The model is based on the idea that conversation partners share certain mutual beliefs which are being established in the course of a discourse (following Clark & Marshall, 1981; Joshi, 1982). It is proposed that:

> *"… speakers use tune to specify a particular relationship between the `propositional content` realized in the intonational phrase over which the tune is employed and the mutual beliefs of participants in the current discourse."*
> (P&H, 1990: 285)

[1] For an approach directly comparing German vs. English intonation please see Grabe (1998).

Although the original model of P & H is called compositional due to the parallel consideration of pitch accents, phrase accents, and boundary tones I will concentrate on the pitch accent aspect here. For reasons of comparability with the other approaches mentioned above this seems to be a necessary restriction.

Pierrehumbert & Hirschberg (1990)

First, P&H state that the salience of an accent is predicted by its location within a prosodic phrase and not by its type. A similar view is shared by Bolinger (1986). However, he differentiates “accents of power” at the end of sentences from “accents of interests” in non-final noun positions of sentences.

P&H furthermore assume the existence of two monotonal (H* and L*) and four bitonal accents derivable from all possible combinations of a low with a high tone (L*+H, L+H*, H*+L and H+L*). These tonal combinations, however, can be realised within one syllable, and, hence do not have to be distributed across adjacent syllables.

H* accents in general are supposed to appear on propositions that are new in the discourse. L* accents, on the other hand, serve to exclude the accented item from the predication that a speaker wants to add to the mutual beliefs of a hearer. It is used e.g. in canonical yes-no questions, to express incredulity, and on cue phrases such as *okay, but, anyway*, and so forth.

The bitonal L+H accents are generally thought *“… to convey the salience of some scale (…) linking the accented item to other items salient”* (P&H, 1990: 294) in the mutual beliefs of the hearer. A further subdivision of these accents then incorporates the location of the asterisk tone on one part of the accent.

L*+H is thought to express that a speaker is not totally committing to the content of his utterance which in turn leads to the sensation of “uncertainty” in the hearer.

Furthermore, also the meaning of the L+H* accent is closely linked to a scalar interpretation. As opposed to L*+H, a speaker utilising the L+H* accent is committing to the predication of what he says. Moreover, he states that this very assertion *“… and not some alternative related item- should be mutually believed.*” (P&H, 1990: 296). Hence, this accent can be attributed to the marking of contrast and correction in English. The second major group of bitonal accents are the H+L accents. These are introduced as “… *evoking a particular relationship between the accented item and H`s* [the hearer’s] *mutual beliefs.”* (P&H, 1990: 297).

As for the H*+L accent, the predication is basically the same as for an H* accent with the addition that hearers *"… should locate an inference path supporting the predication."* (P&H, 1990: 297). It can be employed to make already given information extra salient in a repetition or to strengthen the logical connection between a formerly given and a new piece of information. Additionally, this pattern has often been referred to as calling contour (Pike, 1945; Ladd, 1978).

The H+L* accent, on the other hand, does not make a predication but informs a hearer that he should already know about the mentioned fact. Additionally, it is used with expletives and/ or conventionalised expressions with redundant character like "Oh darn it!" (P&H, 1990: 301) when, e. g. one's car is breaking down repeatedly.

Apart from the various pitch accents, P&H discuss the meanings of boundary tones for utterance interpretation. To summarise shortly, an H% boundary tone is supposed to express "forward reference" while the L% tone does not imply that. Thus, hearers encountering an H% tone implicitly know that the content of a succeeding IPh is relevant for the interpretation of the preceding one.

Based on this very detailed and strict approach, Hobbs (1990) suggested certain generalisations and simplifications in "The Pierrehumbert-Hirschberg Theory of Intonational Meaning Made Simple: Comments on Pierrehumbert & Hirschberg".

Hobbs (1990)

As the basic principle, Hobbs claims that every speaker or hearer fills a subpart of the global communication space with his own *private beliefs*. Furthermore, a set of overlapping *mutual beliefs* exists for communication partners. Most utterances thus serve to turn speakers` private beliefs into mutual or common beliefs. Hobbs claims that the most important function of intonation in discourse is the partition of conveyed information into *new* (yet the private beliefs of the speaker), *given* (mutual beliefs or common ground of speaker and hearer), and *false* (propositions the speaker does not believe to be true).

These functions are conveyed by two basic pitch accents, L* and H*, which can have a prefix (P&H: leading tone), a suffix (P&H: trailing tone) or that are simply monotonal. Furthermore, the meanings of the asterisk tones L* and H* are the same in mono- and polytonal patterns, and the meanings of the accent suffixes is similar to their meaning in phrase accent (PPh) or IPh boundary location.

Another kind of classification is by grouping together monotonal and prefixed accents since H and L convey identical meanings in both accent types. Their semantic function is to render an information salient, either as *new* (H*) or *not new* (L*). According to Hobbs, the latter accent is, however, not automatically determining *givenness*.

The more complex meanings of the prefixed accents result from combinations of the simple H and L meanings. Hence, the intention of L+H* is to convey that *"… you might think this information is not new, but it really is new."* (Hobbs, 1990: 314), and H+L* is indicating that one "… *might think that this information is new, but it really is not new*." Within suffixed accents and PPh and IPh boundary markings the meanings of L and H are again homogeneous. H signals "*incompleteness or open-endedness*" (Hobbs, 1990: 314) while L fails to indicate incompleteness. Note that the meaning of the two tones is not oppositional. The notion of open-endedness is explained by Hobbs as indicating that *"What I've just conveyed by that morpheme or phrase requires further discussion before it is entered into mutual belief, or before its status with respect to mutual belief is agreed upon"* (Hobbs, 1990: 315).

Similarities and differences of Hobbs vs. P&H

In both approaches the monotonal H* accent indicates new information. Regarding the monotonal L* accent, Hobbs solely refines the assumption of *salience without predication* of P&H by stating that propositions marked by this accent can either be *given* or *false* (Hobbs, 1990: 315).

With respect to bitonal pitch accents, the differences between both approaches are more fundamental. In P&H's work, asterisk tones incorporate an aspect of meaning which is not derivable from their meaning as monotonal accents. Hobbs approach, on the other hand, allows for the compositionality of underlying monotonal accent meanings with affixed tones to a cumulative meaning. While P&H group their accents into L+H (rising) vs. H+L (falling) the classification of Hobbs is determined by the position of the asterisk tone. The latter option results in suffixed accents (salience-lending tone in first position) and prefixed accents (salience-lending tone in last position).

According to P&H, the commonality of both L+H accents is their scale-evoking character which is not derivable from the underlying meaning of H or L, though. In Hobbs view, the L* tone signals the givenness or falsity of a proposition. The

following H suffix adds that this proposition is still open. Thus, the corporate meaning of L*+H implies that the stated proposition *"… shouldn't be taken as relevant mutual knowledge until it can be considered further"* (Hobbs, 1990: 317). In accordance, when the asterisk tone is H (L+H*) it is stated that *"… the conveyed proposition is new, whereas the L prefix indicates that the hearer may have believed it to be not new"*.

The H+L accents in P&H's work are considered to imply some kind of relation between the accented item and the mutual beliefs of the hearer. With regard to the H+L* accent, Hobbs attributes the meaning *"You might think that this is new information, but it is not"* (Hobbs, 1990: 316) to it. According to P&H, this particular accent signals that the encountered information is already part of the mutual beliefs, and that the hearer should actually be aware of that. As for the H*+L accent, P&H state that it is implying a predication together with an inference to formerly given information. Hobbs alters this interpretation by stating that a predication is indeed made but its newness *"…, and its truth and status are not open to question"* (Hobbs, 1990: 318).

Uhmann (1991)

Especially concerned with the prosodic realisation of focus in German, Uhmann (1991) proposes four pitch accents, two monotonal ones (H* and L*) and two bitonal ones (H*+L and L*+H). Her model presents a hybrid between the approach of Gussenhoven (1984) and Pierrehumbert (1980). However, more important for the present work are Uhmann`s assumptions regarding focus and topic accents in German. Uhmann (p. 254) states based on phonetic analyses and phonological descriptions that

- L* marks a background (given) constituent.
- H* is assigned to focus as well as background constituents.
- L*+H realises the topic function of an element intonationally.

With respect to the assignment of H* to background constituents, the analyses of Uhmann seem to be questionable since she only provides one example of that. Moreover, this example appears to occur on a sentence-initial constituent and could be attributed to a high F0 onset of this very sentence (p. 251).

More consistent, however, is her finding of the H*+L accent for narrow focus interpretations. Here, she provides examples indicating that this accent pattern is assigned to contrastive (novelty) focus and also to correction focus. In her work, this finding plays a rather subsidiary role but its relevance will become apparent in the phonological analyses of the speech data in the experiments described in later sections of my work.

Féry (1993)

"*German Intonational patterns*" presents the most comprehensive analysis of German intonation based on the autosegmental-metrical framework. The aim of Féry`s work is a phonological description of intonational properties in German, and furthermore, the investigation of other linguistic factors influencing intonation structures. Most relevant in the context of my thesis are, however, Féry`s findings regarding the consequences of (syntactic-pragmatic) focus and topic.

It is important to note that no phrase accents and no leading tones (prefixes) exist in this system, and that nuclear accents (as assigned by the NSR of Chomsky & Halle, 1968) are obligatorily at least bitonal. Three nuclear accents are stated, namely H*+L, L*+H and L*+H+L. Apart from the latter pattern, which replaces the so-called "delayed peak" introduced by Ladd (1983), the bitonal accents are similar to the ones in the work of Uhmann (1991; see above).

Two levels of prosodic phrases are assumed, the Intonational Phrase and an Intermediate (or Phonological) Phrase. However, the Intermediate Phrase comprises no phrase accent, as the movement between the last pitch accent of a phrase and the subsequent prosodic boundary is accounted for by a spreading mechanism of the trailing tone of the last accent.

Most relevant for my work, however, are her assumptions regarding the form (and partly function) of the contrastive accentuation of foci and topics.

With regard to the accentuation of topics, she states that the topicalised constituent forms an Intermediate Phrase of its own. Furthermore, the marked word order induced by the topicalisation is thought to imply intonational consequences (p. 130ff.). These consequences have been noted and described by Jacobs (1982, 1996) as *i-topicalisation*, and by Höhle (1991) as *i-topic intonation* (see chapter 6).

Féry presents various examples and syntactic structures in which this marked i-topic intonation occurs. She presents evidence that the accentuation of the topic

together with the consecutive focus accent form a decisive intonation pattern. It is constituted by an L*+H accent in topic position and an H*+L accent in focus position. This rise-fall course within sentences has been termed *hat pattern* by Cohen and ´t Hart (1967).

In addition, Féry states the existence of another kind of hat pattern (hat contour I; p. 149f.) which is not relying on topicalised sentence constituents.

However, the pattern of hat contour II (L*+H --- H*+L) is convincingly shown to accompany i-topicalisation with a subsequent focus accent. The meaning of the accents becomes apparent in her examples of *"… semantically ambiguous sentences. The choice of the accent form, rising or falling, can disambiguate the two readings in each case."* (p. 133). It is noted that this particular intonation pattern with an L*+H accent on the topicalised sentence constituent also supports the back-referring scope of negation particles. Furthermore, the accent, in her view, indicates the presence of a topic element which is obligatory to interpret the following "statement" (p. 134) or focus part. Féry proposes that *"… the interplay of a rising tone and of a falling tone is what makes us perceive or be aware of this connection. The fact that the hat contour consists of two tightly connected but prosodically relatively independent parts is best represented by two Intermediate Phrases."* (p. 135).

With regard to focus accents, Féry`s results did not reveal differences in the phonological properties of broad vs. narrow focus accents (p. 62 f). Both were commonly to be transcribed as H*+L accents, and could not be differentiated when presented out of context in a perception test (five participants; no further information).

Grice & Baumann (2002)

In "Deutsche Intonation und GToBI" Grice and Baumann summarise the developments in this phonological annotation tool for German intonation. In the following, only the part of GToBI which is concerned with pitch accents will be considered (p. 284 ff.).

Their paper considers only nuclear intonation patterns of German, with nuclear defined in terms of the syllable with the strongest accentuation within the utterance. However, under the account of Grice and Baumann nuclear accents are not obligatorily bitonal (as opposed to Féry, 1993).

Grice and Baumann postulate six so-called tone accents. The monotonal accents are L* and H* again, and the bitonal ones are L+H*, L*+H, H+L* and downstepped

H+!H*. Moreover, phrase accents contribute substantially to the overall intonational contours as well.

Thus, the overall F0 shapes are *falling, rising-falling* (late peaks), *rising, constant, falling-rising, early peaks, and stylised downgrade.* Each F0 contour can be formed by one to three differing realisations of the actual accent. Hence, the authors do not only consider the shape of the accent position but also the F0 course up to the end of the Intonation Phrase (IPh) or utterance. These differing phrasal F0 courses are attributed diverging meanings as well.

However, only the overall *falling* contours which can be formed by two varying accent types can be attributed a focus-related meaning. Thus, only these accentual patterns will be introduced briefly as they are the only one relevant for my work.

For neutral assertions (broad focus) and neutral wh-questions Grice & Baumann note a monotonal H* accent which forms an overall falling contour with the consecutive L- phrase accent.

Contrastive assertions, on the other hand, are marked by a bitonal L+H* accent that forms a falling contour together with the following L- phrase accent. The difference between these two contours is due to a steep rise for the contrastive assertions.

As opposed to Féry (1993) and Uhmann (1991), Grice and Baumann do not assume an H*+L accent in their inventory. In fact, it is exchanged by an H*+L- annotation as the postnuclear low tone is not restricted to a single syllable in their view.

However, the existence of H*+L is not explicitly denied. With reference to the examples on contrast and correction intonation from Uhmann (1991), an H*+L accentuation is (under certain pragmatic circumstances) also considered by Grice and Baumann.

Consequences for the thesis at hand

As already mentioned in section 2.1, the phonological annotations in my thesis are in general based on the GToBI system of Grice and Baumann (2002). Thus, the existence of two monotonal accents (L* and H*) and of bitonal accents (L+H*, L*+H, H+L*) is assumed. However, the assignment and meaning of focus accentuation in this system is somewhat underspecified for the purpose of this thesis.

Thus, with respect to the assumptions of Uhmann (1991) and Féry (1993) the H*+L accent will be considered as a possible prosodic realisation of correction focus.

For the illustration of alignments between syllables and accent peaks or boundary tones of prosodic phrases, the phonological annotation will be carried out syllable-wise as in Grice and Baumann (2002). The determination of a certain accent type will incorporate the location of the F0 peak on the critical sentence element and relate this postlexical accentuation to the lexical word stress. Moreover, the interpretation of prosodic phrase boundaries will also include references to durational properties of the critical sentence elements (see section 2.1).

3 Methodological background

3.1 Event-related potentials (ERPs)

Processing language is a highly complex task, and is solved very rapidly. The methodology of event-related potentials, as opposed to behavioural measures, has been shown to reflect these processes with time lags in the millisecond range only.

The scalp-recorded electroencephalogram (EEG) which is the basis for event-related potentials (ERPs) is primarily formed of mainly postsynaptic electric potentials of pyramidal cells in the neocortex. Originally, the EEG measure was applied to clinical research of brain disorders (Birbaumer & Schmidt, 1991).

In order to measure event-related answers of the brain, a certain amount of these cells must fire simultaneously since ERPs are relatively small (< 10 µV) in comparison to the spontaneous brain activity (50-100 µV). Furthermore, the discharging cells must be arranged in a specific layered way, in so-called *open fields* (Rugg & Coles, 1995; Fabiani, Gratton & Coles, 2000).

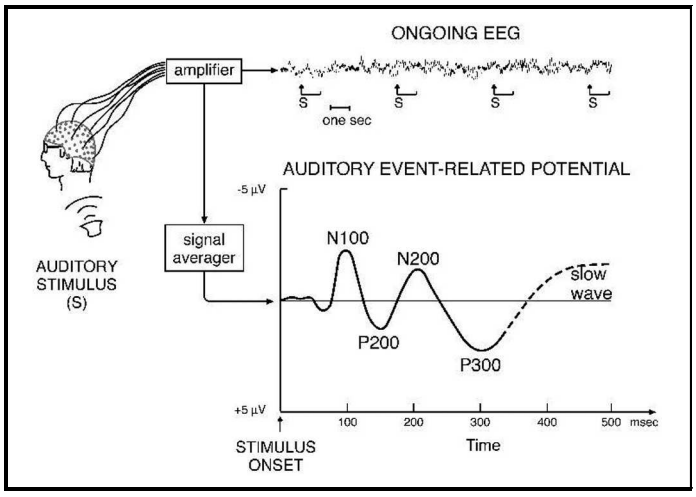

Figure 1: *Illustration of the electro-encephalographic (EEG) recordings and the consecutive computations to extract event-related potentials (ERP).*

As shown in *Figure 1*, ERPs first have to be extracted from the underlying EEG. For this purpose, a number of epochs (approx. 30-40) are being time-locked to the

event of interest, and averaged. By this, the “background noise” of the EEG (i.e. the random brain activity) can be eliminated from the epochs of interest.

The derived ERPs are commonly referred to as *components, peaks, deflections or waves*, and can be specified with reference to their

- Characteristic scalp distribution (which can be lateralised to one hemisphere or distributed over anterior to posterior brain sites).
- Polarity (which can be negative or positive).
- Latency (of occurrence from the onset of an event).
- Experimental variability (e.g. language specificity; dependence on semantic, syntactic or prosodic manipulation).

The annotation of single components mainly relies on their polarity. Here, the capital “N” stands for the negative voltage amplitude of a waveform, and the capital “P” for a positive value. The number following the letter depicts the latency of the component. If ERPs consist of various subcomponents, small Latin letters are used for the discrimination (e.g. N400, P3b). Furthermore, the notation of a component can include statements about its topography (e.g. ELAN= Early Left Anterior Negativity) or the experimental manipulation in charge (e.g. MMN= Mismatch Negativity).

Early occurring potentials (with latencies shorter than approx. 200 msec) are roughly thought to be modulated by the physical properties of an external event. Thus, they are being referred to as *exogenous components*.

Later *endogenous components*, on the other hand, are assumed to be caused by cognitive processes like, for example, language perception. Yet, this classification is an over-simplification. Many of the exogenous components can be affected by attentional processes, and physical stimulus properties can alter many of the endogenous components.

Thus, Rugg & Coles (1995) suggested a continuum with early components up to 100 msec latency referred to as *rather exogenous* components and later event-related responses as *rather endogenous components*.

Psycholinguistic ERP research has focused on the comprehension of written language for a long time. However, nowadays quite many studies use acoustic materials for research (for an overview see Hagoort & Brown, 2000). The positive

side effect of these materials is of course the evaluation of prosodic effects during language processing.

Many of the paradigms in ERP research rely on the violation of structures and/ or expectancies. The electrophysiological components are thus most often to be determined by a comparison of one experimental condition that is supposed to be the default or non-erroneous processing case, and one condition deviating in one or more aspects from it. However, experimental designs for the elicitation of the Closure Positive Shift (see section 3.1.3) allow for the investigation of natural language perception without any violations or ungrammaticalities.

Despite the advantage of a high temporal resolution of ERPs, their spatial resolution does not allow for unequivocal determinations of the neural generators underlying the brain responses. This is mostly due to the varying scalp thickness and cortex folding (gyrification) affecting the electrophysiological response.

In the following, an overview of the language-related ERPs is given. I will concentrate on those ones that have also been related to processing on sentence level.

3.1.1 Semantic processes

One of the first studies exploring psychophysiological correlates of semantic processing was conducted by Kutas & Hillyard (1980b). They visually presented participants with sentences that were either semantically correct or contained a semantic violation in final position. They looked as follows:

Semantically correct: He spread the warm bread with butter.

Semantically incorrect: He spread the warm bread with socks.

The incorrect sentences as compared to the correct ones elicited a distinctive negative waveform approx. 400 msec after the onset of the critical (underlined) word. This negativity was strongest at centro-parietal electrodes. In follow-up experiments (Kutas & Hillyard, 1980a) the effect could be replicated, and shown to reflect difficulties of semantic integration of a word into a context. The amplitude of the N400 was shown to vary with the degree of the semantic violation.

Fischler, Bloom, Childers, Arroyo & Perry (1984) could demonstrate an N400 effect with semantically correct but contextually unexpected words. Here, the

amplitude of the potential became stronger the less predictable a stimulus was in a certain context.

Another factor for the amplitude strength of the N400 is the relative frequency of a word in a certain language. Low-frequent words generally evoke a stronger response than high-frequent ones (Van Petten & Kutas, 1987).

N400 effects have also been reported in the auditory domain. In a study by Holcomb & Neville (1991) participants listened to semantically correct and incorrect sentences. The effect from the visual domain could be replicated, and was again strongest at posterior electrodes. Moreover, the auditory N400 exhibited a shorter latency (approx. 100 msec) and a wider temporal distribution than the visual component. This result was verified by Friederici, Pfeifer & Hahne (1993).

Generally, the linear temporal unfolding of speech (also resulting in coarticulation phenomena and prosodic inferences) as compared to written language is thought to be responsible for the component's latency advantage in the auditory domain. Furthermore, the variable duration of words and, hence, differences in the recognition point of a word can lead to the jittered pattern in the ERPs (see also Marslen-Wilson, 1987).

Arguments in favour of a language specificity of the N400 are supported by a study of Besson & Macar (1987). They presented melodies with correct vs. incorrect final tunes. The violation of the melodic structure did not lead to N400 responses but only to a positive deflection in the ERPs.

However, the N400 effect can also be evoked by the abstract semantic representation of symbols (Gunter, Nakamura & Bach, 2003), by faces (Barrett & Rugg, 1989), and pictures (West & Holcomb, 2002).

Thus, the N400 rather seems to reflect the activation of a modality-independent semantic-conceptional system than of a concrete lexico-semantic one.

3.1.2 Syntactic processes

Besides semantic incongruences, syntactic violations also lead to specific ERPs. Not only one component is reported for syntactic anomalies but various ones differing in latency and scalp topography. Due to the variance in latency, one can differentiate between early and late syntactically evoked potentials. According to the neuro-

cognitive model of sentence processing (Friederici, 2002) three processing stages exist that are related to syntax.

- Phase 1 (100-300 msec): formation of an initial syntactic structure based on word category information.
- Phase 2 (300-500 msec): morpho-syntactic processing resulting in thematic role assignment (and integration of lexico-semantic information as reflected by the N400).
- Phase 3 (500-1000 msec): syntactic reanalysis and repair based on the integration of information from (at least) Phase 1 & 2.

Within Phase 1, the early response (maximum amplitude at approx. 200 msec) which is distributed over anterior electrodes of the left hemisphere has been termed *ELAN* (*Early Left Anterior Negativity*). It is evoked by violations of word category information in a sentence like in the example below.

Correct: Das Hemd wurde gebügelt. *The shirt was ironed.*

Incorrect: Das Hemd wurde am gebügelt. *The shirt was on ironed.*

This component has been found in relation to phrase structure violations in English (Neville, Nicol, Barss, Forster & Garrett, 1991) and German (Friederici, Pfeifer & Hahne, 1993; Friederici, Hahne & Mecklinger, 1996; Hahne & Jescheniak, 2001) for the visual and the auditory modality. However, it does not appear consistently in studies employing written materials (Friederici, Steinhauer & Frisch, 1999) which indicates some relevance of the input modality.

Phase 2 incorporates (besides the semantic N400 component) another syntax-related response between 300-500 msec, the *LAN* (*Left Anterior Negativity*). It has been described for syntactic violations apart from word category ones, namely case marking errors (Coulson, King & Kutas, 1998; Friederici & Frisch, 2000), and subject-verb agreement failures (Gunter, Stowe & Mulder, 1997; Münte, Matzke & Johannes, 1997).

A third syntax-related response which is attributed to Phase 3 of the model is the *P600* (sometimes also named *SPS* for *Syntactic Positive Shift*; Hagoort & Brown, 2000). It is a positive deflection in the ERPs between 500-1000 msec with maximum amplitudes around 600 msec. The P600 often co-occurs with the event-related

potentials from phase 1 & 2. In short, its appearance has been related to phrase structure and subjacency violations (see *ELAN*), violations to the verb-argument structure, subcategorisation and agreement (see *LAN*), as well as for the non-preferred disambiguation of ambiguous sentences (Osterhout & Holcomb, 1992; Friederici, Steinhauer, Mecklinger & Meyer, 1998; Frisch, Schlesewsky, Saddy & Alpermann, 2002).

Due to the diversity of factors that elicit the P600 the ERP component is nowadays more generally conceived as a marker for effortful syntactic integration (Kaan, Harris, Gibson & Holcomb, 2000; Frisch et al., 2002).

3.1.3 Prosodic processes

Consequences of acoustic stimulus presentation on well established ERP components are noted with increasing incidence. As mentioned above, e.g. the latency of the N400 is shorter with acoustic than visual stimuli (Holcomb & Neville, 1990). Such effects of faster word identification are mostly explained by sentence-level contextual factors. The cohort model of Marslen-Wilson (1987) claims that auditory lexical identification in context is even enabled before the acoustic information about a given word has been fully encountered.

However, not only sentential context but also prosody can modulate the language understanding process as reflected by ERPs. Holcomb & Neville (1991) found a posterior negativity preceding the N400 pattern they were actually discussing in their study. Its peak was around 150 msec, and interpreted in their paper as an early N400 onset although its morphology is clearly distinct from the “real” N400 following the first negativity. Nonetheless, they suggested prosodic reasons for this early occurring peak.

Hayashi, Imaizumi, Mori, Niimi, Ueno & Kiritani (2001) conducted an event-related magneto-encephalographic (MEG) study with explicit prosodic violations. MEG is an additional neurophysiological measure with a high temporal resolution which also allows for better spatial interpretation of the responses than EEG.

Hayashi et al. presented participants with Japanese minimal accentual pairs in a question-answer setting. Following a question (i.e., “What colour is the stop light indicating stop?”) either a correctly accented word (“Aka” with the high-low F0 course meaning “red”) or an incorrectly accented word (“aKA” with the low-high F0 course meaning “dirt”) was presented.

The incorrect accentual realisations evoked an enhanced negative magnetic brain response starting at around 250 msec as opposed to the correct prosodies. Furthermore, the neural generators of the reaction were located in both hemispheres of the brain incorporating temporal and parietal cortices. Due to the latency of the response and its spatial distribution they interpreted this result in terms of a (magnetic) N400.

To summarise, all of the studies cited above were more or less concerned with the influence of incorrect intonational patterns on language perception.

However, Steinhauer, Alter & Friederici (1999) presented a first ERP attempt to illustrate the perception of prosodic cues in speech processing beyond a violation paradigm. For this purpose, a German sentence corpus was developed with consistently varying intonational phrasing due to diverging syntactic structures. Examples are given below.

1. [Peter verspricht Anna zu arbeiten]$_{IPh1}$ [und das Büro zu putzen.]$_{IPh2}$
   [Peter promises Anna to work] [and to clean the office.] (literal)
2. [Peter verspricht]$_{IPh1}$ [Anna zu entlasten]$_{IPh2}$ [und das Büro zu putzen.]$_{IPh3}$
   [Peter promises] [Anna to support] [and to clean the office.] (literal)

The manifestations of the prosodic phrasing were exhaustively examined in terms of segment and pause durations, and F0 patterns. Based on these parameters, Intonational Phrase boundaries (IPh; Selkirk, 1984) were determined.

ERP data for the perception of these varying intonation structures displayed centro-parietal deflections which were only attributable to the processing of the IPh boundaries. As a matter of fact, one sentence-internal positive shift was elicited by condition 1 (approx. 500 msec after IPh1), and two positive shifts were evoked by condition 2 (due to IPh1 and IPh2, respectively). This brain response was termed *Closure Positive Shift* (CPS). Since then the CPS has been validated as a universal marker for prosodic phrasing on single sentence level. It has even been shown in studies with written sentence materials. In those, commas (which follow strict rules in German, and are much more numerous than in English) lead to the generation of an internal input-structuring prosody (Steinhauer & Friederici, 2001; Steinhauer, 2003). Furthermore, the independence of the CPS from other than prosodic variation (phonemic, syntactic, and semantic) could convincingly been shown (Steinhauer et

al., 2001; Pannekamp, Toepel, Alter, Hahne & Friederici, 2005). Moreover, the CPS could also been attributed an important role in the structuring of discourse information, hence for the processing of information beyond the sentence level. The consequences of this information structural processing are illustrated in greater detail in the consecutive section.

3.2 The perception of focus – Behavioural and physiological evidence

The perceptual consequences of the scope and distribution of focus in utterances has been the subject of many behavioural studies. However, lately also some (electro)physiological paradigms investigated the online perception of pragmatic focus and accentuation phenomena associated with it.

The behavioural studies most often explore language understanding between situations in which the pragmatic and prosodic foci equally subserve utterance interpretation and situations when these both information sources are in conflict. In addition to behavioural measures, ERP paradigms can uncover whether the brain reacts more strongly to pragmatically determined focus information or on the actual prosodic realisation of the information in focus, and how these reactions manifest psychophysiologically. Furthermore, the on-line interplay of pragmatic and prosodic sources in the language perception process can be investigated. These results can contribute substantially to psycholinguistic models concerned with temporal dimensions of language processing (Friederici, 2002; 2004).

In the following, behavioural results to the perception of pragmatic and prosodic focus will be presented first. Subsequently, previous ERP data on focus perception will be summarised. Conclusions will then be drawn incorporating the results from both experimental measures.

Behavioural data

Cutler & Fodor (1979) were the first to conduct a perception study with dialogues. They used wh-questions to establish pragmatic foci on a certain constituent of a neutrally intonated sentence. Participants were additionally performing a phoneme monitoring task. The phonemes to be detected were either part of the focus domains or not. Participants` reaction times were faster when the phoneme target was in

focus position than when it was not. These results presented first evidence for a decisive role of context and pragmatic foci to guide listeners` attention to sentence elements asked for by a wh-question. Moreover, the data of Cutler & Fodor gave way to other behavioural perception studies manipulating not only pragmatic focus positions but also the accentuation properties related to them (hence, prosodic focus).

Nooteboom & Kruyt (1987), for example, employed Dutch two-sentence combinations with the first sentence rendering the information of a succeeding sentence either *novel* or *given*, thus determined a pragmatic focus and a novelty focus accentuation or not ([+foc/+acc] vs. [+foc/-acc]). Furthermore, sentences were also combined in such a way that the pragmatic foci determined by the first sentence were not accented in the second sentence [+foc/-acc]. In a second mismatch condition, information rendered given by the first sentence was accented in the second sentence [-foc/+acc]. Participants then had to judge the appropriateness of these four types of sentence combinations on a scale. The results showed that listeners prefer associations of pragmatic novelty focus with accentuation [+foc/+acc] and givenness without accentuation [-foc/-acc]. However, inadequate associations between the pragmatically determined information type and accentuation were more acceptable in cases of given information with a focus accentuation [-foc/+acc]. The opposite combination of pragmatic novelty focus without accentuation [+foc/-acc], on the other hand, was hardly ever acceptable for the listeners. Nooteboom & Kruyt interpreted these results as clear indications for a direct relation between the focus and accent structure of utterances. However, the failure of the participants to consistently decline the non-matching associations of given information with accentuation posed some exception to this interpretation. The authors thus hypothesised that the accent on given information can readily be perceived "*to signal thematicity of a given constituent*". (p. 1521). In a similar experiment on English, Bock & Mazella (1983) presented sentence pairs with differing broad and narrow focus intonations that were either matching or non-matching between the sentences. These combinations looked as follows (capitals signal accent positions).

a) ARNOLD didn't fix the radio. DORIS fixed the radio.
b) Arnold didn't FIX the radio. DORIS fixed the radio.
c) Arnold didn't fix the radio. DORIS fixed the radio.
d) Arnold didn't fix the radio. Doris fixed the radio.

Participants were not explicitly instructed about the relation between the sentence combinations. They were asked to press a button when they had understood the meaning of a certain combination. The reaction times showed a clear advantage for the sentence combinations with matching accents (pairs `a` & `d`) over the non-matching combinations (pairs `b` & `c`).

In a second experiment with active vs. passive sentences and varying accent positions on the noun or the verb, this advantage for sentence combinations with matching accentuation could be replicated.

First, these experiments showed that even though participants did not have to judge the appropriateness of the accent combinations they implicitly attributed differing meanings to them. Second, as a side effect, the relevance of the accentuation of a corrected sentence element becomes obvious as the sentence pair `a` with an accented correction showed a reaction time advantage as opposed to pair `b` where the correction is unaccented.

Birch & Clifton (1995) conducted two experiments with English question-answer pairs of the kind illustrated below (capitals signal accent positions). In Experiment 1, participants had to judge the appropriateness of the accentuation pattern of a certain answer sentence (A1-A3) with respect to a preceding context question (Q1 and Q2). In Experiment 2 employing the same stimulus materials, on the contrary, they had to indicate whether the answer was felicitous with respect to a preceding question.

- Q1: Isn't Kerry pretty smart?
- Q2: Isn't Kerry good at math?
- A1: Yes, she TEACHES MATH.
- A2: Yes, she teaches MATH.
- A3: Yes, she TEACHES math.

The status of the verbal argument in the answer sentences was thus either rendered new (by Q1) or given (Q2).

In Experiment 1 (prosodic judgement), the combinations of Q1 with A1 (accent on verb and argument) was rated as most appropriate. The combination of Q1 with A3 (solely verb accent) was rated the least appropriate. This result is not in line with common assumptions about focus spreading from arguments onto complete phrases (Gussenhoven, 1983a; Selkirk, 1995).

The results for the combination of Q2 with varying accent patterns reveal a slightly different picture. Accentuation of a contextually given argument only (A2) is rated least appropriate. In contrast, accents on the argument and the verb (A1) are judged significantly more appropriate. Moreover, participants rated accentuation on the previously unmentioned verb (A3) as the most appropriate combination.

In Experiment 2 (comprehension task), the combination of Q1 with A2 (with sole accentuation of the argument) gave rise to the most positive responses. No difference was obtained for A1 vs. A3 when following Q1. The responses to the combinations with Q2 exactly resembled those of Experiment 1. Verb accent only (A3) yielded the most positive answers and argument accentuation only (A2) the least. Hence, the results of this second experiment are rather compatible with theoretical assumptions of focus spreading. Moreover, it was shown that the accentuation of a given argument was not as disruptive for the comprehension process when the adjacent verb was accented, too.

With special regard to contrastive (non-corrective) focus, Krahmer & Swerts (2001) conducted a production study with four speaker pairs of Dutch utilising a dialogue game. For the elicitation of a certain accentuation (novelty, contrastive, given), cards with different shapes (the nouns) and colours (the adjectives) had to be sorted by pairs of participants. Since the participants could not see each other they had to exchange verbal commands to single out the card for the next move in the game.

Like in German and English, Dutch preferably marks focused sentence constituents intonationally. They showed that the accent types between contrast and novelty differed only in the position of the adjective. For the noun position no difference in accent type was observable. However, the acoustic data also showed that contrastive as opposed to novelty intonation involves deaccentuation. In the instances of contrast on the adjective, speakers commonly employed postfocal deaccentuation (hence, on the noun). When the noun was contrasted, on the other hand, the prefocal adjective was “occasionally” (p. 394) deaccented. Thus, the accentuation pattern for the certain focus condition not only affected the focused adjective vs. noun but also led to intonational consequences in the adjacent word.

In a follow-up perception study, Krahmer & Swerts furthermore evaluated whether participants are able to distinguish between the prosodic realisations of novelty and contrastive focus although the actual accent types did not differ. For this reason,

participants were asked to judge the prominence of the accents, first, when presented within their context of occurrence, and second, isolated from that context.

When the accents were presented in context, contrastive accents were rated more prominent than novelty accents irrespective of their location on the noun or adjective, respectively. However, when the accents were presented out of context, the prominence ratings appeared to be speaker-dependent. While for the one speaker noun accents were generally judged more prominent (p. 397), another speaker gained stronger responses to the contrastive noun accent vs. equal responses for the adjective.

The authors then also conclude that contrastive intonation is not a solitary phenomenon of one syntactic element but affects adjacent elements as well (as shown by the production data), which in turn contributes to the interpretation of an accent as signalling contrast or novelty (see Cooper et al., 1985; Féry, 1988 for similar statements).

With reference to the crossover point between the interpretation of an accent as non-contrastive vs. contrastive, Bartels & Kingston (1994) conducted a perception study with English discourse paragraphs (following Bolinger, 1989). Within these paragraphs, certain prosodic parameters were varied by applying a synthesising procedure. In particular, the height of the F0 peak and the onset of the rise on the focused sentence element were manipulated. Furthermore, the depth of the F0 dip preceding the focus, and the temporal alignment of the F0 peak with the focus-accented syllable were varied.

Testing eight subjects, they found quite consistent crossover points from a non-contrastive to a contrastive accent interpretation. Hereby, the pre-eminent cue for the contrastive interpretation of a focused element was the greater height of the F0 peak. Moreover, the most widely used secondary cue turned out to be the F0 dip preceding the focused word with deeper dips yielding more contrastive responses.

This finding is also in line with the results of Rietveld & Gussenhoven (1985) concerning the role of F0 excursion on the prominence of sentence elements. The stronger the depth of the F0 dip and the higher the F0 peak, the more pronounced is the F0 excursion.

Moreover, the results of Bartels and Kingston uncovered another prominent secondary cue, namely the temporal alignment of the F0 peak within the focus-accented syllable. They found that early peaks contribute extensively to the

perception of focus as being contrastive. This finding is also in line with, inter alia, the assumptions of Gussenhoven (2004: 60f., 93).

As to the specific relation between pragmatic and prosodic properties of corrections in German, Alter, Mleinek, Rohe, Umbach & Steube (2001) conducted another perception experiment. They created small discourse situations either determining a novelty or a correction focus in a sentence (for the prosodic pattern see introduction to chapter 4). In the actual perception experiment these discourses were auditorily presented either with the matching accent pattern to a certain pragmatic focus (novelty focus with a novelty accent and correction focus with a correction accent) or non-matching accent pattern (novelty focus with a correction accent and correction focus with a novelty accent).

The results showed that participants were well able to detect the inappropriate novelty accentuation in discourses determining correction focus. In contrast, the behavioural performance for the detection of inadequate correction accents in discourses determining novelty focus was at chance level. These results, similar to the data of Nooteboom & Kruyt (1987), indicate that the more „emphatic“ (here: correction) accent in a neutral context (here: novelty focus) does not lead to interpretation difficulties. However, the novelty accent in contexts determining correction focus induces difficulties in the interpretation of the respective discourses.

Observations from eye-tracking studies

Sedivy, Tanenhaus, Spivey-Knowlton, Eberhard & Carlson (1995) explored the effect of contrastive intonation for the interpretation of visual scenes. For this purpose, they employed the eye-tracking methodology and measured ophthalmic saccades towards certain parts of visual layouts.

Participants were presented with several cardboard shapes differing in from (e.g. circles, squares, triangles) but also in size (large vs. small forms). While watching a certain cardboard layout, subjects were additionally presented with an auditory instruction of the kind “Touch the large red square”. In 50 % of the instructions the size adjective (e.g. large) was uttered with a contrastive intonation (“Touch the LARGE red square”). The results of the saccade measures showed that contrastive prosody narrowed down the visual scene (i.e. excluded the small forms from the “discourse”) as soon as the prosodically marked adjective was encountered. In particular, participants did not conduct eye saccades towards the excluded discourse

elements anymore. These results were interpreted as evidencing a rapid resolution of discourse reference by a specific, namely contrastive, intonation.

ERP correlates of focus perception

One of the first ERP experiments examining the role of prosody in the perception of information structure were conducted by Hruska, Alter, Steinhauer & Steube (2001; see also Hruska, 2004). Hruska et al. (2001) presented contexts determining pragmatic novelty foci on either a noun or a verb in a succeeding sentence. Examples are presented in the table below.

Noun focus	A1: Wem verspricht Peter zu arbeiten und das Büro zu putzen? *Whom does Peter promise to work and to clean the office?* A2: Peter verspricht [ANna]$_{NEW}$ zu arbeiten und das Büro zu putzen. *Peter promises Anna to work and to clean the office. (literal)*
Verb focus	B1: Was verspricht Peter Anna zu tun? *What does Peter Anna promise to do?* B2: Peter verspricht Anna [zu Arbeiten]$_{NEW}$ [und das Büro zu putzen].$_{NEW}$ *Peter promises Anna to work and to clean the office. (literal)*

***Table 1**: Dialogues from Hruska et al. (2001).*

Dialogues with appropriate associations of a pragmatic and a prosodic focus were derived by combining question A1 with answer A2 and B1 with B2, respectively. On the other hand, dialogues with a non-matching focus-to-accent structure were composed by combining the question A1 with the answer B2, and B1 with A2, respectively.

Hruska et al. found that missing accents in contextually determined focus positions (e.g. the combination of A1 with B2) lead to centro-parietal negativities in the ERPs. Moreover, accents on sentence constituents that were contextually not specified for focus (*superfluous accents*, e.g. the combination of B1 with A2) did not evoke mismatch responses.

In addition to the prosodic mismatch response, ERP effects of the pragmatic focus structure emerged. For the correct associations between focus and accent structure (A1 with A2 and B1 with B2), a centro-parietal Closure Positive Shift (CPS; Steinhauer et al. 1999) was evident in the position of every focused sentence element (noun or verb).

However, when inadequate associations between pragmatic and prosodic focus were presented, results yielded a diverging picture. A non-matching association of a pragmatic noun focus with verb accentuation (A1 with B2) also evoked a centro-parietal positive-going waveform in the position of the pragmatic noun focus. When the context determined verb focus but the accent was on the noun (B1 with A2), however, not the pragmatic focus position (verb) but the accent position (noun) elicited the CPS response.

Taken together, these results could not be accounted for by the perception of Intonational phrase boundaries (IPh; Selkirk, 1984; Nespor & Vogel, 1986) as in the study of Steinhauer et al. (1999). Rather, the CPS in context-free sentences (see section 3.1.3) seemed to be triggered by differing events than in context-embedded utterances.

However, the data of Hruska (2004) are inconsistent with respect to the level of information structure (pragmatics or prosody) relevant for the elicitation of the CPS. The experimental conditions once elicited a CPS in the pragmatically determined focus position, and once in the prosodic focus position.

Moreover, the inappropriate associations of focus and accent structure gave rise to well-established ERPs known from the perception of incongruent semantic and syntactic structure (see section 3.1). The positive-going waveform for the non-matching association of the pragmatic noun focus with verb accentuation (A1 with B2) is not discussed by Hruska (2004) in terms of the Closure Positive Shift. Due to the occurrence of a centro-parietal negativity preceding the positivity, this pattern is discussed in terms of a N400-P600 pattern. Hruska proposes that it is evoked by the missing noun accent which in turn leads to difficulties in the semantic interpretation of the dialogues (N400). This is then followed by a reanalysis of the dialogue's information structure (P600). However, the second violation condition with a missing noun accent (B1 with A2) only leads to a N400 response in the respective verb position, a result which cannot be readily interpreted (but see chapter 4).

Further ERP evidence regarding the role of pragmatic novelty focus positions was presented by Bornkessel, Schlesewsky & Friederici (2003). Although employing written materials that intra-sententially determine focus positions by word-order scrambling (hence, focussing by syntactic means), they found positive deflections to sentence constituents in focus. These potentials appeared in a time range between 280-480 msec, and with a similar posterior parietal scalp distribution than the focus-

induced CPS in the data of Hruska. Bornkessel et al. but term their positive deflection “focus positivity”.

Johnson, Clifton, Breen & Morris Florack (2003) presented further ERP data on the auditory perception of matching and non-matching novelty focus and accent positions. They employed dialogue contexts determining focus positions on either a first or a second noun in a sentence. Examples are given below.

- Rhonda kissed Jason. Who else was kissed by Rhonda? Jeremy was kissed by Rhonda, too.
- Evelyn kissed Jeremy. Who else was Jeremy kissed by? Jeremy was kissed by Rhonda, too.

All possible combinations between contextually determined focus on the first or on the second noun with or without accentuation of this focus position, and with or without accentuation of the non-focused position were presented in an ERP paradigm. Participants had to indicate the appropriateness of the discourse prosody by button-press.

The processing of the pragmatic focus positions (termed semantic focus here) yielded centro-posterior positive deflections. For the focus on the first noun, the response appeared with a latency of 400 msec, whereas it started at about 300 msec for the second noun.

However, the missing accentual marking of pragmatic focus positions elicited anterior and centro-posterior negative waveforms starting at approx. 100 msec only for the second noun position. The lack of an effect on the first noun is not very surprising. The prominence of focus accents is only recognisable by comparisons to the F0 reference line of a sentence. However, in the inappropriate conditions with accents on the first noun this reference line has not been established yet. This perception condition thus seems to be quite similar to a context-free accent presentation as in the study by Krahmer & Swerts (2001).

To summarise, the behavioural studies on focus perception employing acoustic materials point to a strong influence of accentuation on sentence processing. First of all, accented sentence constituents are more salient than unaccented ones. Second, when focus positions are accented the speed and the accuracy in the processing of these elements are increased. On the other hand, the deaccentuation of focused elements leads to a perceptual disadvantage.

By utilising the ERP methodology, various studies have reported centro-posterior positive waveforms to the processing of elements in pragmatic focus. Although this psychophysiological evidence is still rare, the assertions of the temporal and topographical distribution as well as of the eliciting factors of these components are so far convergent. However, they have been attributed differing names, e.g. “focus positivity” (Bornkessel et al., 2003) or “focus-induced CPS” (Hruska, 2004). For reasons of simplification, this positive component will henceforth be referred to as “CPS”.

However, the ERP data for the inappropriate accentuation of pragmatic focus positions is somehow more divergent. In particular, it is to be questioned whether the CPS response for discourse interpretation and structuring is substantially influenced by prosodic properties, thus the focus accentuation (Hruska, 2004, Hruska & Alter, 2004). Yet, there is some indication that intonation patterns that do not match a certain context do not interfere with the perception of the focus positions (Johnson et al., 2003). On the contrary, an inappropriate focus accentuation elicits negative deflections preceding the CPS for the pragmatic focus perception. However, and in congruence with behavioural results, such a negative peak is only evoked when pragmatically focused information is presented without or with a somehow “underspecified” accent. Additional or “overspecified” accents do not lead to negative ERPs.

In addition, most of the very few ERP studies on focus perception have been concerned with comparisons between given and novel information. Moreover, no ERP evidence so far exists for the psychophysiological consequences of the corrective interpretation of utterances. Corrections as subpart of contrastive information comprise differing discourse functions than novel information (see chapter 4). Furthermore, contrastive discourse information can also appear in topic position (e.g. i-topics; see chapter 6). However, contrastive topics do only share some similarities with contrastive focus.

Thus, successive comparisons of correction foci with other types of discourse information could enhance the understanding of the underlying mechanisms responsible for the elicitation of the CPS. In particular, the question whether the CPS presents an exclusive marker for the perception of pragmatic focus positions (as opposed to topic positions and contextually given sentence constituents) will receive

special attention in the work at hand. Furthermore, the influence of accentuation on the processing of pragmatic focus will be investigated in detail.

The results on the ERP consequences of the perception of pragmatically and prosodically focal vs. non-focal discourse information could furthermore contribute to the validation and extension of current models of spoken language understanding (e.g. Friederici, 2002, 2004).

3.3 General design of the experiments

3.3.1 Formation of the stimulus materials

Corpora of German dialogue conversation were created. These were structurally closely matched due to the demands of the ERP methodology. The dialogues consisted of three sentences or questions, respectively. In *Table 2*, a representative example implying correction focus is laid out. It illustrates the speakers` turns, and, furthermore, which part of the dialogue actually entered the acoustic analyses (section 3.3.2).

Each third sentence (3) thus contained the critical focus and accent positions. All experimental conditions are again illustrated in detail in the chapters on the individual experiments (chapter 4 - 7). For all of these experimental variations, the segmental structure of the third sentences was exactly identical. Differences in the focus and accent structure of sentence (3) were achieved by modifying the content of the preceding context (sentence (1) and (2) in *Table 2*).

Introductory sentence (1)	*Speaker A*: Am Samstag hat Peter mir etwas versprochen. *On Saturday Peter promised me something.*
Focus-inducing question (2)	*Speaker B*: Hat er Dir versprochen, Frauke zu entlasten? *Did he promise Frauke to support?*
Focus accent bearing sentence (subject to acoustic analyses) (3)	***Speaker A*: Er hat mir versprochen, [ANna]$_{COR}$ zu entlasten [und die Küche zu putzen.]$_{NEW}$** *He promised Anna to support and the kitchen to clean.*

Table 2: *Examples for the materials determining correction focus (with literal translations). The sentence in bold type entered the acoustic analyses.*

The basic structure of all critical third sentences (3) constitutes as follows: The utterance starts with a matrix clause (“Er hat mir versprochen”) which consists of *given* information with respect to the preceding context. The matrix clause is then followed by a verb phrase consisting of a proper name (the noun “Anna”) which is the object of an adjacent transitive verbal infinitive (“zu entlasten”). This verb phrase is followed by a conjunction clause (“und die Küche zu putzen”).

With respect to the lexical stress patterns of the sentence constituents under special investigation here (namely the noun “Anna” and the infinitive “zu entlasten”), bisyllabic proper names with trochaic stress (e.g. ANna) were exclusively used. The verbal infinitives were between two and four syllables long. Their frequency was matched with the Celex database (MPI Nijmegen). Their lexical main stress was either on the second or on the third syllable.

The materials were realised by two trained female speaker of Standard German in a sound-attenuated room. The speakers were explicitly instructed to mimick a personal communication between them.

As the same speakers were not available for all recording sessions, speakers differ between Experiment I & III vs. II & IV. Reflections of the different speaker “styles” will become apparent when the prosodic realisations of the focus accent bearing sentences will be considered from chapter 4 onwards.

Overall, forty-four dialogues (see Appendix C) were recorded for each experimental condition. All recordings were digitised with the Cool Edit Pro software (Syntrillium Software Corporation; Phoenix, AZ, USA) at 44.1 kHz scanning frequency (16 bit, mono). Their loudness was normalised and matched.

3.3.2 Methodology of the acoustic analyses

As mentioned in section 3.3.1, each third sentence of a dialogue was considered the critical accent bearing sentence. Thus, these sentences (see *Table 2*) entered the acoustic analyses described in the following. However, the discrete outcomes for each experimental variation will only be reported and discussed from chapter 4 - 7.

Calculation of fragment and pause durations

For the calculation of the duration properties of certain sentence fragments and pauses, markers were inserted into the recorded sound files by using the Cool Edit

Software (Syntrillium Software Corporation; Phoenix, AZ, USA). The exact location of these markers within the speech signals is illustrated in *Table 3* - *Table 5*.

$_{1}$Er hat mir ver$_{2}$sprochen$_{3}$ $_{4}$An$_{5}$na$_{6}$ $_{7}$zu ent$_{8}$lasten$_{9}$ $_{10}$und die Küche zu putzen.$_{11}$
He promised me to support Anna and to clean the kitchen. (literal)

Table 3: *Visualisation of the markers in the third sentences of Experiment I, III, and IV.*

Table 3 depicts the location of the markers in the speech signals of Experiment I, III and IV. Overall, 11 markers were inserted to enable exact computations of durational properties of sentence fragments (e.g. the matrix clause ranging from marker 1 to 3), syllables, and pauses.

$_{1}$Er hat mir ver$_{2}$sprochen$_{3}$ $_{4}$An$_{5}$na$_{6}$ $_{7}$am Samstag$_{8}$ $_{9}$zu ent$_{10}$lasten$_{11}$ $_{12}$und die Küche zu putzen.$_{13}$
He promised me to support Anna on Saturday and to clean the kitchen. (literal)

Table 4: *Visualisation of the markers in the third sentences of Experiment II.*

Table 4 illustrates the location of the markers in the speech signals of Experiment II. Here, 13 markers were inserted due to the existence of an additional adjunct (“am Samstag”) in the materials of Experiment II.

$_{1}$Hat er dir versprochen$_{2}$ $_{3}$An$_{4}$na$_{5}$ / $_{3}$Frau$_{4}$ke$_{5}$ $_{6}$zu ent$_{7}$lasten?$_{8}$
Did he promise you Anna / Frauke to support? (literal)

Table 5: *Visualisation of the markers in the context questions of Experiment IV.*

For the interpretation of Experiment IV (see chapter 7), one further analysis was conducted on the context questions preceding the critical accent-bearing sentences. For this reason, markers were inserted into these questions, too. *Table 5* pictures the location of these eight markers.

By utilising a PERL script, the time points of all markers were then transformed into text files. The information from these text files was averaged separately per condition and analysed by two-tailed t-tests using the statistics software SPSS. Thus, arbitrary durations of sentence fragments, syllables, and pauses could be evaluated.

Calculation of the F0 courses per fragment

For the computation of the F0 courses of the critical accent-bearing third sentences per condition, the software Win Pitch (Version 1.89; Pitch Instruments Inc.; Toronto, Canada) was employed.

For each single speech file, one text file was created employing the Win Pitch software. These text files conveyed F0 values (collected in time steps of 20 msec) and their exact location within one sound file. Consecutively, the F0 points were mapped onto the information about the starting and end points of sentence fragments and certain syllables as derived from the markers illustrated in *Table 3* to *Table 5*. For this mapping purpose, an AWK script was programmed. Furthermore, the AWK script also determined the first, the maximum, the minimum, and the last F0 value between two markers. Thus, four F0 values per fragment are utilised to illustrate the F0 movements between two markers.

In addition, missing values within certain time windows were defined. These missing data points incorporated F0 values at zero level (e.g. in voiceless consonants) as they would have substantially altered the F0 means to be computed. Thus, non-intonational (phoneme-bound) alternations of the F0 course were avoided.

The F0 values and its respective time points were then averaged by employing the SPSS software. All missing values were excluded from this analysis. This procedure again took place separately for each experimental condition. The mean F0 values per condition and time point were then added and subtracted 25 Hz (approx. 1.5 semitones of the speaker's range).

Rietveld & Gussenhoven (1985) have reported this value as a perceptual threshold for pitch value differences in connected speech. Hence, extreme F0 values were excluded from the acoustic analyses. Consequently, the acoustic and phonological descriptions do only consider these corrected values. They are to be found in *Table 24* to *Table 27 of Appendix A*. Visual inspection before and after the rejection of the extreme values, however, did not reveal substantial differences in the F0 courses. For Experiment IV, also the F0 course of the context question was calculated to support the interpretation of the ERP data.

The description and visualisation of the individual F0 contours of the third sentences of Experiment I-IV (chapter 4 to 7) and their phonological annotation only considers the F0 contours preceding the conjunction clause ("und die Küche zu putzen"; see section 3.3.1). This clause was only part of the stimulus materials due to

restrictions of the ERP methodology, and is irrelevant for data interpretation. Nevertheless, its existence of course influences the realisation of the prosodic boundary tone on the verb ("zu entlasten") preceding the conjunction clause.

The phonological annotation with GToBI closely follows Grice & Baumann (2002) as specified in section 2.1. As for the matrix clause ("Er hat mir versprochen"), no particular accent type but only the global F0 course is described. This is a necessary restriction since the matrix clause does not convey markers before and after each syllable. As a result, *the* accented syllable within the clause cannot be determined. However, deaccentuation phenomena which often accompany focus intonation can still be interpreted.

On the contrary, the F0 pattern in noun position was exactly labelled by taking into account the lexical stress of the noun (always trochaic) and associating it with the asterisk tone which denotes accented syllables in GToBI. This very rigid procedure implies some consequences for the phonological annotations of the focus accents in the present thesis. First, the accent pattern in noun position is always that of a nuclear accent (in the sense of Cinque, 1993; see section 2.2) which was proposed by Féry (1993) as being obligatory bitonal. Second, no leading tones (prefixes) occur in the current annotation due to the constant trochaic stress pattern of the examined nouns ("ANna").

3.3.3 General procedure of the ERP studies

EEG measurements

The EEG was always recorded from twenty-five Ag/AgCl-electrodes (see *Figure 2*). These were situated inside a cap and placed on the participant's scalp according to the international 10-20-system (Jasper, 1958). Additionally, a ground electrode was placed on the sternum of the subject. The electrodes A1 and A2, which served as the reference of the system, were placed on the mastoids of the ears. Four more electrodes served for the recording of eye movements (electro-oculogram; EOG). These were located above and below the right eye (for vertical movements) as well as in the outer canthus of each eye (for horizontal movements).

During the EEG recordings, the system was referenced to A1. Offline, the system was re-referenced to linked mastoids to determine potential lateralisation effects of ERP components. All impedances between the scalp and electrodes were kept below 5 kOhm by the application of a saline gel.

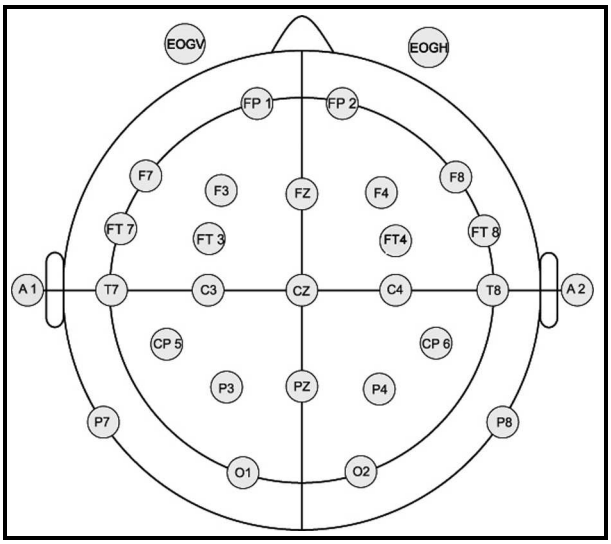

***Figure 2**: Overview of the recording sites on the scalp for the EEG recordings in all experiments.*

Stimulus presentation

Before the EEG recordings, participants were informed about the experiment by a written instruction sheet. Then they were seated in an electromagnetically shielded cabin. A computer monitor situated approx. 80 cm in front of the subject again informed about the course of the experiment and the task.

The experimental control of the presented stimuli and the recording of the behavioural data were taken over by the ERTS software (Experimental Run Time System, Version 3.32c, Beringer, 1997). All the stimuli were presented auditorily via loudspeakers. The recording of the EEG was subserved by PORTI-32-amplifiers (Twente Medical Systems) and the MREFA software (Max Planck Institute for Cognitive and Brain Sciences, Leipzig). Before the actual start of the experiment, subjects performed a small test run with similar stimuli as during the consecutive recorded presentation.

Each experiment reported from chapter 4 - 7 consisted of four experimental conditions. Each condition comprised 44 dialogues. These overall 176 trials (or dialogues) per experiment were presented in a pseudo-randomised manner, and divided into four blocks. Resting breaks were inserted between blocks. The block presentation was additionally randomised per subject to control for position effects of dialogues within each experiment.

The temporal course of one experimental trial constituted as follows:

Presentation of the context sentences	1000 msec ISI	Presentation of the target sentence	Solution of the task < 4000 msec

Table 6: *Illustration of the temporal course of one representative experimental trial.*

Within each trial, the context sentences (see section 3.3.1) were presented first. They were followed by an inter-stimulus interval (ISI) of 1000 msec during which a fixation cross on the monitor served to calm the eye movements of the participants. While still watching the fixation cross, subjects then listened to the focus accent bearing third sentences.

The overall duration of each experiment lasted between 50 - 65 min. None of the participants took part in more than one experiment of the series reported from chapter 4 – 7.

Task

After the presentation of one dialogue trial, a question was visually presented on the screen. This question was “Passt die Betonung?” (literal: “Is the accentuation appropriate?”).

As participants had been instructed about the task before the experiment, they knew that they were to judge the third sentence’s accentuation in relation to the context sentences preceding it.

Participants were asked to indicate their decision concerning the prosodic appropriateness by pressing on a two-buttoned key box in front of them.

3.3.4 Computation of the event-related potentials (ERPs)

For the processing of the EEG signals the software EEProbe 3.2. (Max Planck Institute, Leipzig) was used.

First, an automatic correction for ocular artefacts was applied to each single data set. By this, periods with eye movements larger than 40 μV were rejected. It was then followed by a manual adjustment to identify drifts and further artefacts.

Second, the exact time points of the occurrence of a certain stimulus type were calculated by merging information from the experimental control software ERTS, and the EEG recordings. Single averages per subject and condition were computed across the artefact-free trials of the third (target) sentences. The last 200 msec before the onset of a sentence served as the baseline for this computation. This procedure was followed by the calculation of a group average across all participants. Only those participants with more than 60 % valid trials (of 44 dialogues per condition) entered this group-wise computation. For the calculation and visualisation of ERP effects to particular sentence constituents (e.g. focus positions) the temporal information derived from the acoustic analyses was used. Utilising a PERL script, the markers for constituent onsets and pauses in the speech signal were added to the sentence onset time points as computed by the ERTS software.

By means of coherence throughout the experiments, the offset of the matrix clause (marker 3 of the acoustic analyses, see *Table 3 and Table 4*) was chosen to determine potential effects of focus. Based on this marker, single and group averages were again calculated. Again, the last 200 msec before the offset of the matrix clause served as the baseline.

3.4 Scheme for the statistical analyses

Behavioural results

For each experiment the behavioural performance across participants was averaged by means of correct answers per condition. These results are displayed as percent correct of the overall answers per single condition. Since the subjects were not instructed to give their judgements as fast as possible, reaction times are not reported. Nevertheless, no response slower than 4000 msec is reported in the section on the behavioural results.

ERP data

All conducted analyses of the electrophysiological results took place for the midline and lateral electrodes. Six regions of interest (ROI) were defined. An overview is given in the following table.

Left anterior ROI: F7, F3, FC3	Midline: FZ	Right anterior ROI: F8, F4, FC4
Left central ROI: T7, C3, CP5	CZ	Right central ROI: T8, C4, CP6
Left posterior ROI: P7, P3, O1	PZ	Right posterior ROI: P8, P4, O2

Table 7: *ROIs for the ERP statistics*

These ROIs and the midline electrodes were subjected to the following analyses. Basically, analyses of variance (ANOVAs) were carried out. The statistical design incorporated the factors Condition, Region, and Hemisphere. When statistically significant interactions of the factor Condition with the factor Region or Hemisphere were detected, new ROIs were formed depending on the kind of interaction. Given an interaction between the factors Condition and Region, an anterior ROI was defined which consisted of the electrodes from the left and right anterior ROI as well as FZ. Analogous to that, a central ROI was formed by pooling the electrodes of the left and right central ROI, and CZ. A posterior ROI then consisted of the electrodes from the left and right posterior ROI, and PZ. When analyses revealed an interaction of the factors Condition and Hemisphere two arrays were newly pooled. The left-hemispheric array comprised of the electrodes F7, F3, FC3, T7, C3, CP5, P7, P3, and O1. Analogous to that a right-hemispheric ROI consisted of F8, F4, FC4, T8, C4, CP6, P8, P4, and O2. These newly defined ROIs served to disentangle the interactions. In the case of an interaction of the factor Condition with both other factors ANOVAs were computed for single ROIs. All interactions of the factor Condition with the factor Region were automatically corrected for repeated measurements. As a result, the statistical tables in Appendix A only show F- and p-values that are already adjusted by the Greenhouse-Geisser-Epsilon computation.

In general, the analyses were carried out in successive time windows (TW) of 500 msec, starting at the offset of the matrix clause. Moreover, the time windows for an earlier negativity which is only present in the averages from sentence onset were of variable size. They differ across experiments in latency (between 800 - 1100 msec post sentence onset), and length (between 500 - 1000 msec). Overall, five TW were analysed for the Experiments I, III and IV while seven TW were analysed for Experiment II. In general, only those (positive-going) electrophysiological responses are discussed and interpreted in chapter 4 – 8 whose amplitude exceeds 2 μV.

4 Experiment I: Correction focus vs. Novelty focus

Experiment I was concerned with the intonational realisation of utterances incorporating correction foci and novelty foci. Furthermore, it was evaluated how the pragmatic and prosodic focus structure in German dialogue conversation is processed by the brain. Special attention received the question whether and which electrophysiological brain correlates are evoked when dialogues with non-matching pragmatic (as determined by contexts) and prosodic (as determined by accentuation) focus structures are presented to listeners.

Focus can be subdivided by means of the size of a focused constituent. This distinction is referred to in the literature as broad vs. narrow focus (Ladd, 1980). The intonational consequences of this distinction have been specified in section 2.1. In general, it is assumed that broad focus accentuation follows syntactic rules (e.g. Cinque, 1993). Narrow focus accents, on the other hand, are freely distributable in sentences and depend on the preceding contexts and on speaker intentions. Moreover, it has been claimed that narrow focus always elicits a contrastive interpretation (Chomsky, 1971; Bolinger, 1972). Yet, in the view of Chafe (1976) a focus can, but does not have to be contrastive regardless of its position within a sentence. When taking into consideration the communicative function of narrow focus, it can be subdivided on semantic-pragmatic grounds into a *novelty information* variant and a truly *contrastive* variant. Thereby, only the contrastive variant can also be corrective. The commonality of novel and contrastive information is, however, that they the represent *"…the part of the sentence which forms the assertion, whereas the rest of the sentence is presupposed."* (Umbach, 2004: 158). According to Chafe (1976) sentence constituents are only contrastive when one proposition corrects an explicit or implicit assumption of an interlocutor, and when the number of alternative propositions is limited (see also Cruttenden, 1986). When the alternative set of propositions is narrowed down so much that all alternatives but one are exhaustively excluded the corrective focus variant is achieved in communication. Alternative notions in literature include *counterassertive* (Dik, 1980; Gussenhoven, 1983a), *exhaustive `kontrast`* (Vallduvi & Vilkuna, 1998), and *all-exclusion contrast* (Molnár, 2001). Gussenhoven (2004) and Frota (2000) even report typological evidence from various languages (e.g. European Portuguese, Zagreb Serbo-Croatian) for a formal distinction of novelty vs. correction focus. Related to this typological evidence, the

English particle “but” can, inter alia, be used in utterances implying contrastive new as well as corrective meanings. In German, on the other hand, corrections have to be formulated with the particle “sondern” while otherwise the “aber” is appropriate (Umbach, 2004: 171). In order to allow for an unequivocal corrective interpretation of focus, a proposition has to be explicitly established (the so-called *corrigendum*) which can then be revised by the *corrigens.* In contrast, novel information can simply be determined by a wh-question. The wh-pronoun then leads to the introduction of a new entity to the discourse, and, in turn, extends the discourse set. Corrections, on the other hand, do actually not extend the “size” of a discourse topic since one proposition is exchanged for another proposition. As a consequence, corrections have also been termed “backward-referring utterances” (Steube, 2001a).

Concerned with the acoustic realisation of the both types of narrow focus, strongly diverging opinions exist in the literature. Ladd (1980) supposes that especially the accent distribution within an utterance cues the interpretation of a focus as either transmitting new or contrastive information. Most of the experimental considerations in this regard are, however, concerned with the question whether contrastive accents are formally different from novelty accents. The idea of diverging accent types has been mainly put forward by Pierrehumbert & Hirschberg (1990). As illustrated in detail in section 2.4, Pierrehumbert & Hirschberg proposed that a monotonal H* accent accompanies neutral assertions, whereas a bitonal L+H* pattern conveys contrastive meanings in discourse. A similar result for German novelty vs. correction focus has been reported by Alter et al. (2001). Here, acoustic analyses revealed H* accents on discourse elements in neutral statements (novelty focus) whereas corrective information was produced with an L*+H accent as proposed by Pierrehumbert & Hirschberg (1990). However, other investigations on German, i. e. Uhmann (1991) and Féry (1993), consistently analysed accents on novelty foci as monotonal H* accents, and accents on contrastive (and corrective) information as bitonal H*+L accents. Furthermore, contrastive as opposed to novelty accents have been attributed higher pitch peaks resulting in the sensation of “emphasis” (Brown, Currie & Kenworthy, 1980; Ladd, 1983). Related to the notion of greater perceptual prominence for correction accents, deaccentuation of pre- and postfocal sentence constituents has also been noted to be of importance (Cooper et al., 1985; Féry, 1988; Wagner, 1999). Thus, not solely the sentence element in prosodic focus can be marked for contrastivity but the overall pitch contour of a phrase or a sentence contributes to its salience as well. In partial congruence with these observations,

Chafe (1974) and Couper-Kuhlen (1984) reported sudden drops in pitch (hence, postfocal deaccentuation) only after contrastive accents but not after non-contrastive accents in English. Concerned with more phonetic details of contrastive intonation, Bartels & Kingston (1994) found that the F0 peak height is the strongest perceptual cue to correction accents. However, the peak height cue is closely followed by secondary signs, namely the steepness of the F0 slope on the corrected element, and the timing of the high F0 peak. In detail, early F0 peaks within sentence constituents contribute more to a contrastive interpretation than late F0 peaks.

To summarise, the data regarding potential similarities or differences between novelty and contrastive accents are far from consistent. Some research attempt even failed to show differences between contrastive and non-contrastive accents (Bolinger, 1986: 342; Krahmer & Swerts, 2001).

4.1 Materials

Table 8 illustrates the composition of the dialogue conditions in Experiment I. Each dialogue consists of three sentences.

In the critical third sentence with correction accentuation (condition COR) the noun “Anna” is contrasted with the noun “Frauke” from the preceding question. Hereby, a correction focus is established only on “Anna” as all other constituents are contextually given.

The condition giving rise to novelty accentuation (condition NEW), on the other hand, conveys a wh-pronoun in the question preceding the third sentence. This pronoun gives rise to two pragmatic novelty foci, namely in noun position “Anna” and in the verb position “zu entlasten”. As both constituents (noun and verb) are explicitly rendered novel by the preceding question, it is not assumed that they create a (pragmatic) *broad focus*.

Both conditions (COR and NEW) additionally constitute a novelty focus in the conjunction clause. This clause is not explicitly asked for and, hence, ambiguous between a broad or narrow focus reading.

The complete materials for Experiment I can be found in Appendix C.

CORRECTION FOCUS (COR)	A: Am Samstag hat Peter mir etwas versprochen. *On Saturday Peter promised me something.* B: Hat er Dir versprochen, Frauke zu entlasten? *Did he promise Frauke to support?* **A: Er hat mir versprochen, [ANna]$_{COR}$ zu entlasten** **[und die Küche zu putzen.]$_{NEW}$** *He promised Anna to support and the kitchen to clean.*
NOVELTY FOCUS (NEW)	A: Am Samstag hat Peter mir etwas versprochen. *On Saturday Peter promised me something.* B: Was hat er Dir denn versprochen? *What did he promise you?* **A: Er hat mir versprochen, [ANna]$_{NEW}$ [zu entLASten]$_{NEW}$** **[und die Küche zu putzen.]$_{NEW}$** *He promised me Anna to support and the kitchen to clean.*

Table 8: *Examples of the materials used in Experiment I (with literal translations). Sentences in bold type entered the acoustic and ERP analyses.*

The comparison of the conditions COR and NEW first allows for the evaluation of focus accent properties in German. Second, the processing of focus can be investigated under conditions (*Table 9*) where the pragmatic and prosodic foci equally subserve the interpretation of a discourse situation vs. when they are in conflict. For the purpose of the ERP and behavioural measures, two conditions with matching pragmatic and prosodic focus structures (CC and NN) were presented to participants. Furthermore, two conditions with non-matching pragmatic and prosodic focus structures (CN and NC) were composed by combining the two context sentences of one condition (NEW or COR, respectively) with the focus accent bearing sentence of the opposite condition (COR or NEW).

All of these matching and non-matching combinations between the contextually determined pragmatic focus and the prosodic focus (accentuation) are illustrated in *Table 9*.

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction (COR)	Correction (COR) in the critical sentence (condition CC)	* Novelty (NEW) in the critical sentence (condition CN)
Novelty (NEW)	Novelty (NEW) in the critical sentence (condition NN)	* Correction (COR) in the critical sentence (condition NC)

Table 9: *Formation and annotation of the conditions in Experiment I. The star (*) signals the incongruence of the pragmatic and the prosodic focus structure.*

The condition annotation in *Table 9* as well as for the behavioural and ERP data is arranged as follows: The first letter of the condition name denotes the contextually determined (pragmatic) information structure ("C" for correction focus, and "N" for novelty focus). A second letter then designates the actual prosodic focus realisation ("C" for correction accentuation, and "N" for novelty accentuation). Thus, when the first and the second letter coincide, the association of the pragmatic and the prosodic focus do match. When they disagree, on the other hand, the pragmatic and the prosodic focus are incongruent.

For the analyses of the ERP data, always the conditions with identical intonational realisations but diverging preceding context information will be compared. By doing so, confounded effects of the pragmatic and prosodic focus structure are avoided.

4.2 Questions and Hypotheses

Prosodic focus realisation

It is hypothesised that the pragmatically different focus types of correction and novelty imply intonational consequences. According to Pierrehumbert & Hirschberg (1990), novelty is realised in English with a monotonal H* accent while contrast is characterised by a rising L+H*. On the other hand, Féry (1993) and Uhmann (1991) ascribed a monotonal H* accent to novel information in German utterances, and a bitonal H*+L to the realisation of contrast and correction in German.

As the focus accents in the current stimulus materials always appear in nuclear position (following Cinque, 1993) they should be bitonal obligatorily (Féry, 1993). Since the language under examination is German, corrections are expected to

display a falling H*+L pattern. For the realisation of novelty, however, it is unclear whether monotonal or bitonal accents will be displayed.

Moreover, as previous studies have shown, it is hypothesised that the F0 course in correction utterances displays patterns of pre- and/ or postfocal deaccentuation.

Behavioural results

It is expected that participants are well able to recognise the appropriate sentence combinations with pragmatic correction foci realised with an correction accentuation (condition CC) and novelty foci presented with novelty accentuation (condition NN).

As for the inappropriate combinations of focus and accent, the previous results of e.g. Alter et al. (2001) and Hruska (2004) suggest that hearers are also well able to detect "missing" accents on pragmatically focused information. In contrast, "superfluous" accents are readily accommodated to.

However, the accentual differences in the work at hand are probably more subtle. In all conditions, focus accents will be apparent on the noun ("Anna"). It is solely hypothesised that these might differ between conditions. On the other hand, the correction focus should exclusively elicit an accent in noun position while the novelty focus might display an additional accent on the focused verb ("zu entlasten").

Thus, when participants base their appropriateness judgements on the previously proposed salience of correction accents (see introduction to Experiment I), they should be well able to detect when a pragmatic correction focus is presented with the accentuation of novelty (condition CN). However, when participants ground their decisions on the missing accentuation of the focused verb (like in condition NC) the behavioural results should be different. Subjects would then be expected to perform better in condition NC than in condition CN.

A necessary prerequisite for the latter assumption is, however, that the pragmatic verb focus establishes a discrete prosodic focus, and does not merge with the preceding focused noun as suggested by Selkirk (1995).

ERP data

Based on the previous data of Hruska (2004) and Hruska & Alter (2004) it is assumed that a Closure Positive Shift (CPS) accompanies the perception of focus in conditions with a congruent focus - accentuation combination. Hence, condition CC

should elicit one CPS in the position of the focused noun (“Anna”). Moreover, condition NN should lead to two CPS deflections in the position of the focused sentence elements, namely the noun (“Anna”) and the verb (“zu entlasten”). In the conditions with non-matching combinations of pragmatic and prosodic focus (conditions CN and NC), it is unclear whether the CPS will pre-eminently reflect the perception of the pragmatic or the prosodic focus. In this regard, the results of Hruska (2004) are inconsistent (see section 3.2). However, based (partly) on the ERP data of Hruska, and pre-eminently on the data of Johnson et al. (2003) and Bornkessel (2003) it is hypothesised that a CPS will be elicited due to the pragmatic focus positions. Hence, condition CN (revealing a pragmatic focus only on the noun “Anna”) should exhibit one CPS deflection to the perception of the noun. Condition NC (which gives rise to pragmatic foci on the noun “Anna” and the verb “zu entlasten”) should reveal two CPS responses due to the processing of the noun and the verb.

Furthermore, an effect in form of a centro-posterior negativity could be expected when the pragmatic focus structure does not match the prosodic structure (conditions NC and CN). According to the data of Hruska, this effect becomes apparent when accents on a pragmatic focus are missing. However, the nouns (“Anna”) in the current speech materials are always focus *and* accent positions. It is only the particular kind of accent (novelty or correction) that is appropriate or inappropriate with respect to a preceding context. Hence, it can only be expected that a negative deflection accompanies the perception of an accent whose perceptual salience is somehow “underspecified” with respect to the context. As correction accents have often been described as more prominent or “emphatic” it is assumed that a negative ERP will be apparent when novelty accentuation is perceived in a context determining corrective information (condition CN).

4.3 Acoustic and phonological analyses

4.3.1 Segment and pause durations

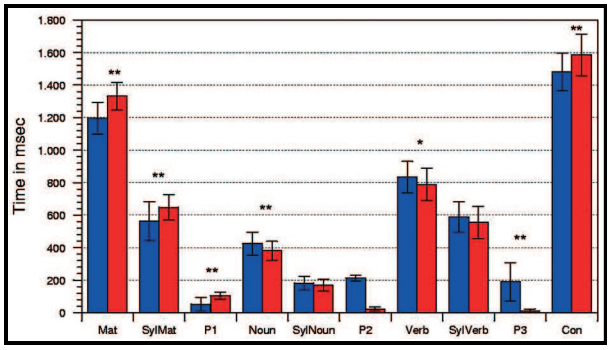

Figure 3: *Segment and pause durations in the focus accent bearing third sentences of Experiment I (*p .05; **p .01). The blue bars depict the resul ts for corrections (COR), and the red bars for novelty (NEW).*

Figure 3 and *Table 20* (Appendix A) display the segment and pause durations within the focus accent bearing sentences of Experiment I, and statistical analyses of differences between the realisations of corrections (COR) vs. novelty focus (NEW).

First of all, the global sentence length does not differ significantly between conditions. In the matrix clause (Mat) and in its last syllable (SylMat) the durations are significantly longer for condition NEW than for condition COR. This pattern is resembled in the following pause (P1). In the consecutive noun position “Anna” (Noun), this proportion is twisted. The length of the noun is significantly longer in condition COR. In accordance, the following pauses (P3) and constituents (Verb, SylVerb) display longer durations in condition COR. Hence, the proposed novelty focus in verb position of condition NEW is not manifested by durational means.

4.3.2 Analysis and phonological description of F0

For reasons of visualisation, *Figure 4* displays the F0 course within a representative single sentence with novelty (NEW) accentuation first.

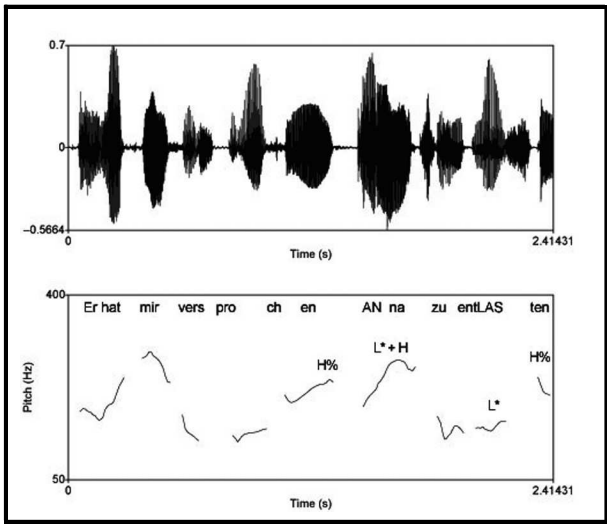

Figure 4: *Oscillogram and F0 course of one focus accented sentence from condition NEW for illustration.*

Figure 5 and *Table 24* (Appendix A), on the other hand, exhibit the averaged F0 values of the forty-four critical accent-bearing sentences per condition (correction of the noun = condition COR; novelty on the noun and the verb = condition NEW). All displayed F0 values and their corresponding time points in *Figure 5* are derived from computations described in section 3.3.2. Phonological annotations of accents and prosodic boundaries follow the framework introduced in the end of section 2.1. Moreover, they are based on the averaged F0 values.

The averaged intonation contours exhibit an early high accent in the matrix clause („Er hat mir versprochen“) of condition NEW while condition COR shows a deaccented pattern. Furthermore, a high boundary tone (H%) is notable on the last syllable of the matrix clause for condition NEW. In accordance with the durational values (see section 4.3.1), this pattern is interpreted as an IPh boundary. On the contrary, condition COR shows a low phrase accent towards the offset of the matrix clause (L-).

The height of the F0 peak in the following focused noun position (“Anna”) differs just slightly between conditions. However, the salience of the correction accent in condition COR is pronounced by patterns of pre- and postfocal deaccentuation. The overall F0 excursion on the noun is also higher in condition COR as opposed to NEW which might render its prominence (Rietveld & Gussenhoven, 1985).

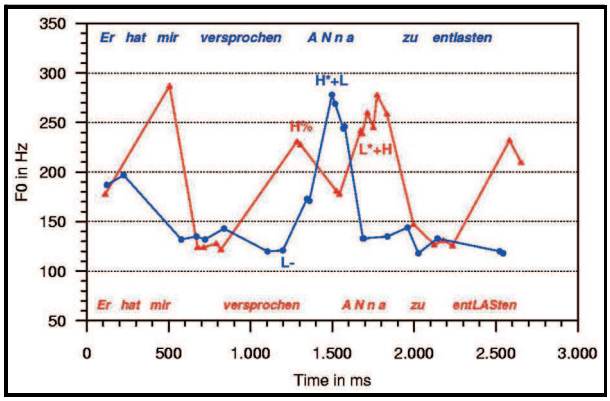

Figure 5: *F0 pattern in the third sentences (without conjunction clause) of Experiment I. Capitals signal accent positions. The blue line depicts the F0 course for correction focus on the noun (COR) while the red line indicates the F0 course for novelty focus on the noun and the verb (NEW).*

The phonological annotation of the nuclear accent in condition COR is that of H*+L as its peak lies in the lexically stressed first syllable of the noun (“Anna”) and the F0 drops down steeply after the peak. The F0 contour after the noun in condition COR is rather compressed. Obviously, the contour on the verb (“zu entlasten”) is influenced by the low suffix (or trailing) tone of the accent. Thus, it is being annotated as L-L%.

The nuclear accent on the noun (“Anna”) in condition NEW is transcribed as L*+H since its accentual peak is postponed to the second syllable which does not carry the lexical main stress. A postnuclear accent can be attributed to the position of the verb (“zu entlasten”). To decide whether the high F0 peak at the right edge of the verb has to be interpreted as an accent or as the boundary tone of an IPh, *Figure 4* was additionally consulted. In considering the single F0 course, it becomes apparent that the verb’s syllable with main stress (“entLASten”) conveys a low tone (L*). Towards the right edge of the verb the F0 ascends again which is interpreted as the manifestation of a high IPh boundary tone. Taken together, the overall F0 contour on the verb can be transcribed as L*+H-H%.

4.4 Experimental data

Twenty-one volunteers took part in the ERP experiment (ten female). Their mean age was 22.9 years (sd 1.81). All were right-handed (Oldfield, 1971), and without any known neurological or hearing disorders.

During the EEG recordings, they were auditorily presented with 176 dialogue trials (44 per condition). After each trial, they had to judge whether the intonation contour of the last sentence was appropriate with respect to a preceding context (see section 3.3.3 for details).

4.4.1 Behavioural results

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction	Correction (CC) = 85.5 %	* Novelty (CN) = 80.1 %
Novelty	Novelty (NN) = 86.6 %	* Correction (NC) = 58.4 %

Table 10: *Correct answers per condition in Experiment I.*
The star (*) signals the inappropriateness of a pragmatic and a prosodic focus structure.

As apparent from *Table 10*, participants judged both conditions with congruent pragmatic and prosodic foci (correction = CC; novelty = NN) as matching in more than 85 % of the trials. Moreover, they are also well able to detect the mismatch when a context determines a correction focus which is then followed by the prosodic realisation of novelty (CN; above 80 %). On the other hand, the prosodic pattern of a correction focus in novelty context (NC) is hard to perceive by listeners. The correct answers decrease to 58.4 %.

4.4.2 ERPs to correction accentuation

Figure 6 displays the averaged ERP data for the 21 participants in Experiment I when processing the third sentences of the dialogues. However, the figure solely visualises the brain responses to the prosodic realisations of corrections. Hence, only the context preceding the accentuation patterns actually differs.

The solid lines depict the ERPs to the processing of correction accentuation that matches the preceding context (condition CC). The dotted line, on the other hand, illustrates the ERPs when the pragmatic and the prosodic information are in conflict. Here, the pragmatic focus determines novelty while the prosodic properties are those of correction focus (condition NC). Furthermore, the left part of *Figure 6* displays the ERPs as averaged from the beginnings of the focus accent bearing sentences. The right part, in contrast, depicts the same computation with an average onset just before the focused noun (“Anna”).

The general results of the statistical analyses can be found in *Table 29* of Appendix A.

Descriptively, the right part of *Figure 6* exhibits a sustained posterior positive waveform (CPS) with high amplitude starting at approx. 500 msec post sentence onset for condition CC (solid line). Condition NC (dotted line), on the other hand, displays a shorter positivity with lower amplitude in the same time window. This is then followed by a second positivity starting at about 1000 msec and lasting for another 1000 msec.

The statistical analysis of the conditions CC vs. NC uncovers the first main effects Condition in the time windows (TW) between 500-1000 msec ($F(1,20)= 34.83$; $p\leq.01$), and 1000-1500 msec ($F(1,20)= 22.96$; $p\leq.01$).

Within the TW between 1500-2000 msec a main effect Condition ($F(1,20)= 15.63$; $p\leq.01$) is revealed, and a three-way-interaction of the factors Condition x Hemisphere x Region ($F(2,40)= 3.37$; $p\leq.05$). The decomposition of this interaction results in effects Condition in all ROIs (left anterior: $F(1,20)= 11.23$; $p\leq.01$; right anterior: $F(1,20)= 9.96$; $p\leq.01$; left central: $F(1,20)= 15.30$; $p\leq.01$; right central: $F(1,20)= 12.70$; $p\leq.01$; left posterior: $F(1, 20)= 10.66$; $p\leq.01$; right posterior: $F(1,20)= 12.79$; $p\leq.01$).

Figure 7 serves to illustrate the electrophysiological responses to correction accentuation in matching contexts (condition CC; top row) vs. non-matching contexts (condition NC; bottom row) in form of voltage changes across the scalp in three representative time windows (compared to the right part of *Figure 6*). This kind of visualisation provides additional support for the context-dependent elicitation of the positive brain deflections. The maps are computed from the same underlying data points as the ERP plots. They reveal once more that a pragmatic correction focus with a matching accentuation (condition CC) evokes one sustained posterior high voltage positive deflection throughout all three considered TW. When the context determines novelty followed by correction accentuation (condition NC), on the other hand, the first TW (600-800 msec) shows a posterior positivity which is then interrupted in the second TW (900-1000 msec). Within the third TW (1100-1300 msec) the positivity is increased again. Besides, the overall amplitudes of the positivities to condition NC are less pronounced than the amplitude to condition CC.

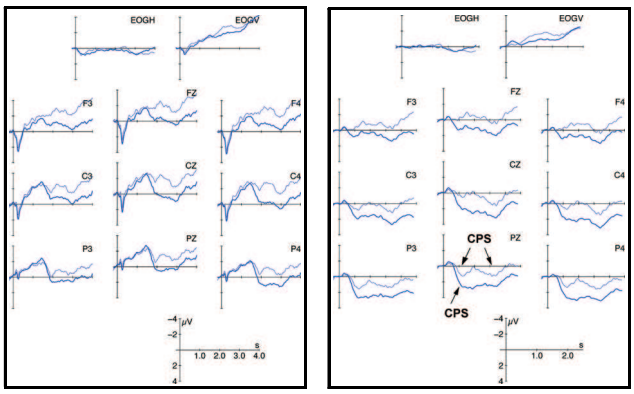

Figure 6: *ERPs (5 Hz low-pass filtered) to the presentation of correction accents (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (CC), and the dotted line in non-matching context (NC).*

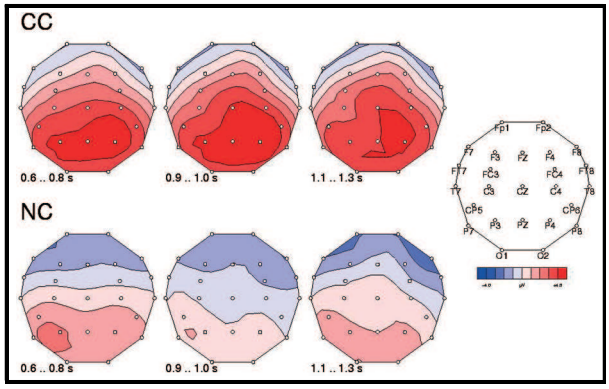

Figure 7: *Electro-cortical maps of the varying positivity pattern for the conditions CC and NC in TW of 600-800 msec (left), 900-1000 msec (middle) und 1100-1300 msec (right). The reddish colours mark positive-going voltage shifts whereas the bluish shades signal negative-going voltage shifts.*

Taken together, the voltage variation between condition CC and NC demonstrates that the context giving rise to one pragmatic correction focus in noun position (condition CC; ”Anna”) elicits one strong posterior positive shift. On the contrary, the context inducing two pragmatic novelty foci in noun and verb position (condition NC; “Anna”, “zu entlasten”) evokes two weaker posterior positive deflections when these foci are processed.

4.4.3 ERPs to novelty accentuation

Figure 8 again displays the ERP data of 21 participants when processing the third sentences of the dialogues. This time, the figure visualises the brain responses to the prosodic realisations of novelty. As a consequence, only the context preceding the accentuation patterns actually differs.

The solid lines depict the ERPs to the processing of novelty accentuation that matches the preceding context (condition NN). The dotted line, on the other hand, illustrates the ERPs when the pragmatic and the prosodic information are in conflict. Here, the pragmatic correction focus is presented with the prosodic properties of novelty (condition CN). The left part of *Figure 8* once more displays the ERPs as averaged from the beginnings of the focus accent bearing sentences. The right part, in contrast, depicts the same computation with an average onset just before the focused noun (“Anna”).

The results of the statistical analyses can also be found in *Table 29* of Appendix A.

In the left part of *Figure 8*, a centro-posterior negative waveform (NEG) is exhibited by condition CN (dotted line). It starts at about 800 msec and lasts for about 1000 msec.

The right part of the graph displays one positive deflection (CPS) at posterior electrodes for condition NN (solid line) starting at approx. 500 msec, and a second one starting at about 1000 msec. Condition CN (dotted line), on the contrary, demonstrates only one sustained positivity with high amplitude.

Statistical analyses for the comparison of the ERP pattern of condition NN vs. CN yield a main effect Condition ($F(1,20)= 4.39$; $p\leq.0\ 5$) in the TW chosen to analyse the negative deflection (800-1800 msec post sentence onset).

The analyses for the positive-going ERPs were again carried out in successive TW of 500 msec post matrix clause offset. A first effect Condition is evident in the TW between 500-1000 msec ($F(1,20)= 30.91$; $p\leq.01$).

The consecutive TW between 1000-1500 msec reveals a main effect Condition ($F(1,20)= 47.49$; $p\leq.01$), and a three-way interactio n of the factors Condition x Hemisphere x Region ($F(2,40)= 12.01$; $p\leq.01$). Its dec omposition results in effects Condition in all considered ROIs (left anterior: $F(1,20)= 19.37$; $p\leq.01$; right anterior: $F(1,20)= 19.70$; $p\leq.01$; left central: $F(1\ ,20)= 17.37$; $p\leq.01$; right central: $F(1,20)= 19.12$; $p\leq.01$; left posterior: $F(1,\ 20)= 26.04$; $p\leq01$; right

posterior: F(1,20)= 16.00; p≤01). In addition, the last TW from 1500-2000 msec yields a main effect Condition (F(1,20)= 24.76; p≤.0 1) again.

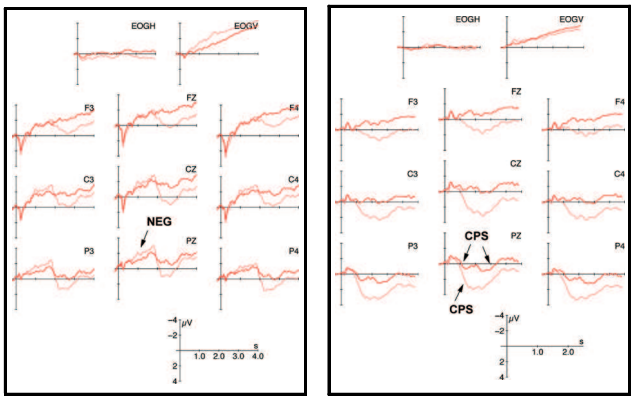

Figure 8: *ERPs (5 Hz low-pass filtered) to the presentation of novelty accents (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (NN), and the dotted line in non-matching context (CN).*

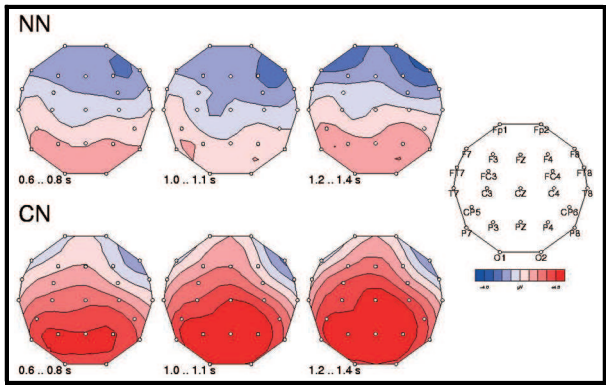

Figure 9: *Illustration of the differences in the positivity pattern between the conditions NN and CN in TW of 600-800 msec (left), 1000-1100 msec (middle) and 1200-1400 msec (right). The reddish colours mark positive-going voltage shifts whereas the bluish shades signal negative-going voltage shifts.*

Figure 9 visualises the ERP responses to novelty accentuation in adequate contexts (condition NN; top row) vs. inadequate contexts (condition CN; bottom row) in form of voltage changes in three representative time windows (compared to the right part of *Figure 8*). Once more the maps provide further evidence for the context-dependent elicitation of the positive brain deflections.

Moreover, they show that the presentation of pragmatic novelty focus with a matching accentuation (condition NN) elicits two separate positive brain deflections. The first considered TW (600-800 msec) reveals a posterior positivity which is intersected by the second TW (1000-1100 msec), and resumed in the third TW (1200-1400 msec).

In contrast, a pragmatic correction focus presented with the accentuation of novelty (condition CN) induces only one, however high voltage, positivity throughout all TW.

Thus, the voltage changes for the conditions NN and CN reveal that the context motivating a pragmatic correction focus in noun position (condition CN; ”Anna”) induces a strong positivity due to the perception of the focus position. Opposed to that, the context which constitutes two pragmatic novelty foci in noun and verb position (condition NN; “Anna”, “zu entlasten”) elicits two, also weaker, positive deflections when these focus positions are encountered.

4.5 Summary and discussion of Experiment I

Experiment I was concerned with the prosodic realisation and the perception of correction and novelty focus.

The acoustic analyses (see section 4.3) show that the pragmatically different foci give rise to differing intonational realisations in German. Regarding focus accent properties, correction focus accents (COR) in nuclear noun position (“Anna”) can be transcribed as H*+L in terms of GToBI (Féry, 1993; Uhmann, 1991). The pattern of a novelty accent in nuclear noun position (NEW), however, can be annotated as L*+H. Moreover, the correction focus accentuation (COR) is accompanied by patterns of pre- and postfocal deaccentuation (Cooper et al., 1985; Féry, 1988, 1993). The novelty condition, on the other hand, displays an additional postnuclear accent on the verb (“zu entlasten”) which is also interpreted as an L*+H accent, respectively.

Thus, the hypothesis (see section 4.2) which stated differing intonational realisations for novelty vs. correction accentuation in German has to be accepted. While corrections display pre- and postfocal deaccentuation and an H*+L accent in the nuclear focus position, novelty is produced with decisive tone movements throughout the utterance and a bitonal L*+H accent in nuclear position (“Anna”).

In congruence with the hypotheses regarding the behavioural results, listeners are well able to recognise when pragmatic foci are realised with an appropriate focus intonation (condition CC and NN).

Furthermore, the behavioural results (see section 4.4.1) indicate that listeners are also well able to detect an inappropriate novelty accentuation in the correction-inducing context (condition CN). However, when a correction accentuation is encountered in contexts longing for a novelty focus interpretation (NC), participants are not able to consistently rate the correction accentuation as inappropriate.

A similar experimental outcome has been interpreted by Alter et al. (2001) in terms of the detection of an "underspecified" accent (a monotonal H* accent was exchanged for a bitonal L+H*). This kind of interpretation, however, does not hold for the current results. Both focus accents, correction and novelty, are in nuclear position (following Cinque, 1993), and are bitonal. Thus, participants seem to base their decisions about the appropriateness of an accentual pattern in a certain context on different prosodic properties of the speech signals.

First, participants seem to have quite rigid expectations about the realisation of a correction accentuation as reflected by the results for condition CN. In detail, novelty accentuation is strongly rejected when the context entails the correction focus. This behavioural pattern could be attributed to the missing pre- and postfocal deaccentuation but also to the particular accent type (L*+H) realised on novelty.

Second, people's expectations about the accomplishment of novelty accentuation seem to be more variable as indicated by their behaviour to condition NC. Notably, the correction accentuation in novelty context is not consistently declined. Thus, even the strong pre- and postfocal deaccentuation and the particular accent type (H*+L) do not render the correction accentuation inappropriate in novelty context.

In congruence with the discussion of the ERP data in the next paragraph, the following explanation is offered for this phenomenon. The nouns in nuclear and focus accent position (e.g. "Anna") in all experimental conditions are lexically determined for trochaic stress. While the high accentual peak in the correction accent (H*+L) is aligned with the primary stressed syllable, the high peak in the novelty accent (L*+H) is postponed to the second syllable of the noun. As mentioned beforehand, the condition with the misaligned pitch peak (condition CN; novelty accent in correction context) is consistently rated as inappropriate by the subjects while the condition with aligned peaks (NC; correction accent in novelty context) is more readily accepted.

The advantage of condition NC (aligned pitch peak) over condition CN (non-aligned pitch peak) is interpreted, inter alia, by Gussenhoven (2004: 60f., 93). He refers to a study of Smiljanic and Hualde (2000) and Smiljanic (2003) who were concerned with the realisation of broad vs. contrastive focus in Zagreb Croatian (a Croatian dialect without lexical tone contrasts). They found that the latitude of peak alignment differs between focus accents in this language variety. In this variety, the high tone (H*) of an accent must be precisely articulated in the primary stressed syllable of a sentence constituent to induce a contrastive interpretation. On the other hand, it can be realised within or after that syllable for a broad focus meaning. However, when the H* is articulated in a "sloppy" manner, hence, in the following syllable, it cannot signal the contrastiveness of an accent. Similar conclusions were drawn by Frota (2000) when examining European Portuguese and by Bartels & Kingston (1994) considering contrastive vs. non-contrastive accents in English.

Gussenhoven (2004) interprets these findings in terms of the "*Effort Code"*. In detail, the *Effort Code* suggests that the "sloppy" realisation of an accent involves less articulatory effort and is thus preferred when no explicit contrast has to be expressed. On the contrary, the speaker *must* employ this articulatory effort to gather a perfect alignment between the lexical stress and the high peak of the focus accent when a specific contrast shall be transmitted.

Thus, the novelty accent (L*+H) in the present data might just not be compatible with a contrastive (correction) interpretation as its high peak is not aligned with the trochaic stress of the noun ("Anna"). However, the H*+L accent can be ambiguously interpreted due to the alignment of stress and accent.

With respect to the hypotheses (see section 4.2) on listeners` reactions to the non-matching focus – accent combinations (conditions CN and NC) an influence of the "missing" verb accentuation (in condition NC) can be negated. Listeners are unable to identify the missing accentuation of the verb in a consistent way. According to Selkirk (1995) a prosodic focus domain has to be marked only once to be focused at all. Thus, when one assumes (as Selkirk would) that the noun and the verb merge together into one focus domain, the verb accentuation would not be obligatory anyway.

To summarise, participants seem to base their prosodic appropriateness decisions on the salience of the focus accent in a certain prosodic environment. This results in

a consistent rejection of condition CN. Thus, the salience-based hypothesis (see section 4.2) regarding prosodic focus perception has to be accepted.

The behavioural results are further corroborated by the ERP data (see section 4.4). In particular, the detection mechanism for the novelty accent in a context promoting a corrective interpretation (condition CN) appears to be reflected by a sustained centro-posterior negative waveform (NEG) between 800-1800 msec post sentence onsets. Obviously, this negativity starts well before the actual focus accented noun position is encountered. Thus, participants also seem to employ prefocal prosodic cues (i.e. missing deaccentuation) to interpret the novelty accentuation as non-matching to a correction context. However, there is no electrophysiological reaction evident for the non-matching correction accentuation in the context implying novelty (NC).

As for the behavioural results, the assumptions of Gussenhoven (2004) can also account for the negative-going ERPs. While the correction accentuation is ambiguous due to the alignment of lexical stress and accentual peak (H*+L pattern of the noun “Anna”), the novelty accentuation (L*+H) is not appropriate in contexts assigning correction. The latter instance again presents a misalignment of lexical stress and accent peak. As a result, a cerebral mismatch response is only elicited when a pragmatic correction focus is realised with the intonation of novelty (condition CN).

For the positive ERP deflections, however, the eliciting factors are fundamentally different ones. When the novelty context gives rise to two pragmatic focus positions on the noun (“Anna”) and the verb (“zu entlasten”), two posterior positive shifts reflect the processing of these foci. This pattern is apparent when the conditions NN and NC are processed. On the other hand, the context inducing a pragmatic correction focus on the noun (“Anna”) elicits one sustained high amplitude positive shift (conditions CC and CN).

These positive-going ERPs are not influenced by the adequacy in prosodic realisation of the respective accent position. Condition NC evokes two positive deflections in noun and verb position regardless of the prosodic focus which signals a correction only in noun position. Condition CN, on the contrary, gives rise to only one positive waveform to the perception of the corrected noun although the accentuation

signals novelty in noun and verb position (i.e. no deaccentuation of the verb). Hence, each of the two proposed novelty focus positions yields a separate deflection. This pattern supports the assumption of two narrow pragmatic information foci (noun and verb) as opposed to a broad focus domain. Yet, the separation of the positive shifts cannot be proven statistically. The amplitude of the positive shift to the pragmatic correction focus (in the particular comparison between condition NN and CN; see section 4.4.3) is so strong that the TW between both deflections still reveals significant differences between conditions (see *Table 29* of Appendix A). For this reason, Experiment II was conducted (see chapter 5).

Based on the latency, the scalp distribution, the morphology, and the evoking conditions, the positive ERPs are henceforth interpreted as focus-induced Closure Positive Shifts (CPS) as suggested by the dialogue studies of Hruska (2004) and Hruska & Alter (2004). Hruska extensively discussed the relevance of (pragmatic and prosodic) focus positions as the eliciting factors of the CPS on dialogue level. Her findings presented clear indications that the CPS elicited in context-embedded utterances is not attributable to the perception of IPh boundaries as it is on single sentence level (Steinhauer et al., 1999; Pannekamp et al., 2005).

However, the data of Hruska showed some inconsistencies with respect to the impact of pragmatic vs. prosodic focus information for the perception process (see chapter 3.2). In her work, the conditions with matching associations of a pragmatic focus and a particular focus accent (either on the noun or the verb) exhibited a coherent CPS pattern in the *pragmatically* determined focus position.

In contrast, the data diverged when conflicting pragmatic and prosodic focus information was perceived. When the context ascertained a pragmatic focus in verb position but the accent appears to be on the noun, the actual *accent* position is pre-eminently processed. The CPS is then evoked to the accent position of the noun. Hruska attributed this finding to the higher salience of the noun accent as opposed to the adjacent (declinated) verb accent.

However, when the context in her studies determined a pragmatic focus in noun position but the accent signalled verb focus, the posterior positive deflection was confined to the *pragmatic* focus in noun position. Yet, this latter positivity in the data was not discussed in terms of the CPS but in terms of a P600. Generally, the P600 is ascribed to the syntactic reanalysis and structural repair of sentences (see section 3.1.2). In Hruska (2004), however, the occurrence of the P600 was explained by the

missing focus accent on the noun which leads to a reanalysis of the information structure of the dialogue (p. 88f.).

In the ERP data under investigation here, however, no P600 effect is apparent. The amplitude difference in the CPS responses to the pragmatic focus positions is solely due to the correction contexts as opposed to the novelty contexts, and does not vary as a function of the appropriateness of the focus-to-accent mapping.

Moreover, the strict reliance of the CPS on pragmatic focus also suggests a partial reinterpretation of the posterior positive deflections of Hruska (2004: 80ff.). The electrophysiological response to the conditions with non-matching pragmatic noun focus with verb accentuation could well expose a contextually driven CPS in noun position underlying the "mismatch" P600. It remains unclear otherwise why each condition (including the violation with pragmatic verb focus and noun accentuation) apart from the noun focus – verb accent combination should display a CPS as a function of information structural processing in her experiment.

Notwithstanding, the CPS in Hruska`s condition with verb focus – noun accent cannot be attributed to the perception of a pragmatic focus position but only to the noun accent as the CPS is confined to the noun position. In this regard, the author's interpretation in terms of the strong accentual prominence in noun position as the CPS-eliciting factor is supported by the assumptions of Bolinger (1987). He emphasises the dissimilarities of accents in the beginning of utterances ("accents of power") vs. accents on phrase-final elements, hence in nuclear positions ("accents of interest", following the assumptions of Chomsky & Halle, 1968). Bolinger states that the accent of power "…*competes for the same prosodic resources as accents of interest and has to be adjusted to them, but it has an existence of its own*.", and "*That accent in the beginning of my utterance is to bowl you over …*" (p. 17).

Thus, there is some indication that the early noun accent in a context determining pragmatic focus on a later occurring sentence element (i.e. the verb) can override a context-bound interpretation in favour of a prosody-bound one.

However, the CPS in Experiment I is constantly elicited by the processing of the pragmatically determined focus positions. This might partly be attributable to the fact that the earlier occurring noun position ("Anna") is always realised with a (correction or novelty) focus accent but is invariably a pragmatic focus position. The following verb ("zu entlasten"), on the other hand, is not pragmatically focused within correction contexts (condition CC and CN) but prosodically focused in condition CN. Yet, in

congruence with the results of Hruska, its actual prosodic realisation is not of the same importance as the noun accentuation.

In accordance with the stated hypotheses, the Closure Positive Shift (CPS) was proven to be an electrophysiological response to the information structural processing of dialogues. Contexts determining a correction focus in noun position (conditions CC and CN) consistently elicit one CPS to this very position. On the contrary, contexts imposing novel information foci on the noun and the verb (condition NN and NC) continually display two CPS responses in temporal coupling to both of these positions.

In addition, the independence of the CPS from an appropriate accentuation of the underlying pragmatic focus positions of nouns and verbs could be proven.

Moreover, an early centro-posterior negative waveform (NEG) is apparent when a context determines correction focus but the accentuation “solely” signals novelty focus. This negativity does not seem to reflect a pure mismatch of the noun focus accent but also incorporates subjects` interpretation of prefocal accentuation patterns. The observation that only the novelty accentuation of actual corrective information (condition CN with non-aligned stress and accent peaks in noun position) leads to an ERP reflection is in congruence with the behavioural data, and in accordance with the hypotheses (see section 4.2). In contrast, the corrective accentuation of actual novel information (condition NC with aligned stress and accent peaks) does not elicit an ERP, and, as the behavioural data suggest, is also not consistently judged as inappropriate.

5 Experiment II: Correction focus vs. Novelty focus (with adjunct insertion)

Experiment II was once more concerned with the intonational realisation of utterances incorporating correction foci and novelty foci. However, Experiment II served to further separate the pragmatic and prosodic focus positions of the noun ("Anna") and the verb ("zu entlasten"). For this reason, a contextually given temporal adjunct ("am Samstag") was inserted into the focus and accent bearing third sentences of the dialogues as employed for Experiment I.

In addition to the extended syntactic and pragmatic structure of the dialogues, a different female speaker produced the dialogues for Experiment II. Thus, it could be evaluated whether the speaker-specific accentuation of corrective vs. novel information is similar or different from the production data in Experiment I. In short, the speaker of Experiment I produced corrected information on a noun in nuclear position ("Anna") as a bitonal H*+L accent. Furthermore, she employed pre- and postfocal deaccentuation to increase the salience of the correction accent. On the contrary, she used L*+H accents to mark the novelty of the focused noun ("Anna") and the verb in focus ("zu entlasten").

With respect to the actual ERP experiment II, the extended dialogue versions present an attempt to separate the CPS responses to the adjacent noun and verb position not only on a descriptive basis. In Experiment I, it was impossible to provide statistical arguments for a segregation of the successive CPS deflections to the noun and the verb in novelty context. Thus, for Experiment I the insertion of a contextually given sentence element between the focus positions might enable the statistical proof of separate brain deflections to these sentence positions.

Moreover, by inserting the temporal adjunct ("am Samstag") which detaches the noun and the verb both elements can be considered as narrow foci in the sense of Ladd (1980).

The intonational consequences of narrow focus on novel and corrective information have been extensively demonstrated in section 2.1 and in chapter 4.

As follows, Experiment II served to evaluate the prosodic properties of correction and novelty focus in extended dialogue situations. In addition, the validity of the behavioural results and the ERP data derived from Experiment I could be assessed.

5.1 Materials

Table 11 displays the composition of the dialogue conditions in Experiment II. These materials were created analogous to the materials for Experiment I.

Each of the dialogues consists of three sentences. Within the third sentence with correction accentuation (condition COR) the noun “Anna” is contrasted with the noun “Frauke” from the preceding question. By this, a correction focus is constituted on the noun “Anna” while all other sentence constituents (apart from the conjunction clause) are contextually given.

CORRECTION FOCUS (COR)	A: Für den Samstag hat Peter mir etwas versprochen. *As for Saturday, Peter promised me something.* B: Hat er Dir versprochen, Frauke am Samstag zu entlasten? *Did he promise Frauke on Saturday to support?* **A: Er hat mir versprochen, [ANna]$_{COR}$ am Samstag zu entlasten [und die Küche zu putzen.]$_{NEW}$** *He promised Anna on Saturday to support and the kitchen to clean.*
NOVELTY FOCUS (NEW)	A: Für den Samstag hat Peter mir etwas versprochen. *As for Saturday, Peter promised me something.* B: Was hat er Dir denn für den Samstag versprochen? *What did he promise you for Saturday?* **A: Er hat mir versprochen, [ANna]$_{NEW}$ am Samstag [zu entLASten]$_{NEW}$ [und die Küche zu putzen.]$_{NEW}$** *He promised Anna on Saturday to support and the kitchen to clean.*

Table 11: *Examples of the materials used in Experiment II (with literal translations). Sentences in bold type entered the acoustic and ERP analyses. Although the literal English translations might suggest that the attachment of the adjuncts is not ambiguous.*

The condition inducing novelty accentuation (condition NEW), on the other hand, conveys a wh-pronoun in the question preceding the third sentence. This pronoun implies two pragmatic novelty foci, namely on the noun “Anna” and on the verb “zu entlasten”. As opposed to Experiment I, both pragmatic focus positions are separated by a temporal adjunct (“am Samstag”). This optional argument of the following verb is introduced during the context sentences under similar syntactic requirements which render it contextually given (Kamp & Reyle, 1993).

Both conditions (COR and NEW) additionally constitute a novelty focus in the conjunction clause again. The complete materials for Experiment II are to be found in Appendix C.

As in Experiment I, the comparison of the conditions COR and NEW allows for the evaluation of focus accents properties in German. Moreover, condition NEW provides two consecutive novelty foci separated by given information. Thus, the description of prosodic properties of [- focus] or givenness in German can be considered briefly (but see chapter 7 for a more detailed analysis).

Second, the online processing of focus can be investigated under conditions where the pragmatic and prosodic foci equally subserve the interpretation of a discourse situation vs. when they are in conflict (*Table 12*). Within the ERP experiment, two conditions with matching pragmatic and prosodic focus structures (conditions CC and NN) were presented to participants. Furthermore, two conditions with non-matching pragmatic and prosodic focus structures (conditions CN and NC) were composed by combining the two context sentences of one condition (NEW or COR, respectively) with the focus accent bearing sentence of the opposite condition (COR or NEW).

All of these matching and non-matching combinations between the contextually determined pragmatic focus and the prosodic focus (accentuation) are illustrated in *Table 12*.

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction (COR)	Correction (COR) in the critical sentence (condition CC)	* Novelty (NEW) in the critical sentence (condition CN)
Novelty (NEW)	Novelty (NEW) in the critical sentence (condition NN)	* Correction (COR) in the critical sentence (condition NC)

Table 12: *Formation and annotation of the conditions in Experiment II. The star (*) signals the inappropriateness of a pragmatic and a prosodic focus structure.*

The condition annotation in *Table 9* as well as for the behavioural and ERP data is arranged as in Experiment I: The first letter of the condition name denotes the pragmatic focus structure (“C” for correction focus, and “N” for novelty focus).

A second letter then designates the actual prosodic focus realisation (“C” for correction accentuation, and “N” for novelty accentuation). Thus, when the first and the second letter coincide, the association of the pragmatic and the prosodic focus do match. When they disagree, on the other hand, the pragmatic and the prosodic focus properties diverge.

For the analyses of the ERP data, always the conditions with identical intonational realisations but diverging preceding context information will be compared. By doing so, confounded effects of the pragmatic and prosodic focus structure are again avoided.

5.2 Questions and Hypotheses

Prosodic focus realisation

As mentioned beforehand, inter alia, in section 3.3.1, the speaker of the materials for Experiment II was not the same as for Experiment I. Hence, the prosodic properties of correction (COR) vs. novelty accents (NEW) in German can be investigated in a different setting.

Once more, it is assumed that the pragmatically differing focus types of correction and novelty imply intonational consequences. Based on the prosodic findings for the speech materials in Experiment I, it is assumed that the correction and the novelty accents display a bitonal pattern due to their nuclear positions (according to Cinque, 1993; Féry, 1993). Thereby, the accent on the corrected noun (“Anna”) is expected to display a falling H*+L accent. The constituents in novelty focus, namely the noun (“Anna”) and the verb (“zu entlasten”) are thought to exhibit rising L*+H patterns again.

As a result, the proposed misalignment detection of trochaic stress and focus accent peak (Gussenhoven, 2004) for the novelty as opposed to the correction accentuation can be considered as well.

In addition to the particular focus accent properties, pre- and postfocal deaccentuation is thought to accompany the intonation of correction focus but not of novelty. However, the inserted temporal adjunct (“am Samstag”) should be deaccented in both conditions (COR and NEW) as it invariantly consists of previously given information.

Behavioural results

The behavioural results are expected to closely follow the ones obtained in Experiment I. Thus, it is expected that participants are well able to recognise those experimental trials where a pragmatic correction focus is realised with a matching accentuation (condition CC), and when a novelty focus is presented with novelty accentuation (condition NN).

For the incorrect associations of pragmatic and prosodic focus (conditions CN and NC) the hypotheses are directly derived from participants` behaviour in Experiment I. As it has been shown that listeners base their prosodic appropriateness judgements on the salience of the correction accentuation, it is expected that they are well able to reject those instances where a pragmatic correction focus is presented with the accentuation of novelty (condition CN). On the other hand, participants are thought to more readily accept the conditions where novel information is presented with a corrective accentuation (condition NC).

ERP data

Based on the ERP data from Experiment I, it is again assumed that a Closure Positive Shift (CPS) accompanies the perception of focus in conditions with congruent focus – accentuation association. Hence, condition CC should elicit one CPS in the position of the focused noun (“Anna”). Moreover, condition NN should lead to two CPS deflections in the position of the focused sentence elements, namely the noun (“Anna”) and the verb (“zu entlasten”). However, the CPS responses in condition NN should be separable not only on a descriptive but also on a statistical basis as the novelty foci are divided by the contextually given temporal adjunct (“am Samstag”).

Furthermore, it is expected that the CPS in the incongruous focus - accentuation conditions (i.e. conditions NC and CN) is elicited by the perception of the pragmatic focus positions. Thus, condition CN (which prompts a pragmatic focus on the noun “Anna”) should display one CPS deflection to the perception of the noun. In contrast, condition NC (determining pragmatic foci on the noun “Anna” and the verb “zu entlasten”) should evoke two statistically separable CPS responses to the processing of the noun and the verb position. Overall, no CPS response is expected to the perception of the temporal adjunct (“am Samstag”) since it has been rendered given information by the preceding context sentences.

In addition, a centro-posterior negativity is predicted to accompany the perception of condition CN. This assumption strongly relies on the ERP data from Experiment I. Condition CN provides a situation where the context determines a correction focus in noun position (“Anna”) which is then realised with a novelty accentuation. It has been argued in section 4.5 that the (rather sustained) negative waveform can be attributed to listeners` detection of “missing” prefocal deaccentuation in the beginning of utterances with novelty accentuation. Moreover, the non-alignment of the trochaic stress and the focus accent peak has been claimed to elicit such a “mismatch” negative ERP.

Since the eliciting condition (condition CN) for this negativity is similar in Experiment II, an analogue ERP is expected for the accent proposed to be underspecified in perceptual salience, namely the novelty accent in correction context. The elicitation of the negative ERP in Experiment I could also provide evidence that this obviously prosodically driven brain response is independent from speaker-specific accentuation patterns.

5.3 Acoustic and phonological analyses

5.3.1 Segment and pause durations

Figure 10 and *Table 21* (Appendix A) display the segment and pause durations within the focus accent bearing sentences of Experiment II, and statistical analyses of differences between the realisations of corrections (COR) vs. novelty focus (NEW).

It can be noted in *Table 21*, that the global sentence length does not differ significantly between conditions. One first durational effect in the materials of Experiment II (*Figure 10*) is evident on the last syllable of the matrix clause (SylMat) which is longer for condition NEW. For the noun position (Noun) and also its last syllable (SylNoun), the duration is longer in condition COR as opposed to NEW. Furthermore, the length of the pause preceding the conjunction clause (P4) is greater for condition NEW again. As there is no duration difference in verb position (Verb, SylVerb) the proposed novelty focus on the verb is thus not signified by durational means.

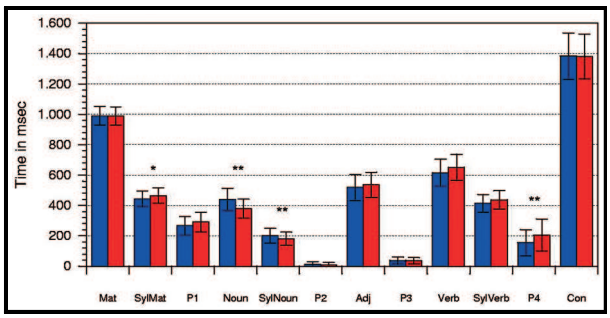

Figure 10: *Segment and pause durations in the focus accent bearing third sentences of Experiment II (*p .05; **p .01). The blue bars depict the resul ts for corrections (COR), and the red bars for novelty (NEW).*

5.3.2 Analysis and phonological description of F0

For reasons of visualisation, *Figure 11* displays the F0 course within a representative single sentence with novelty (NEW) accentuation first.

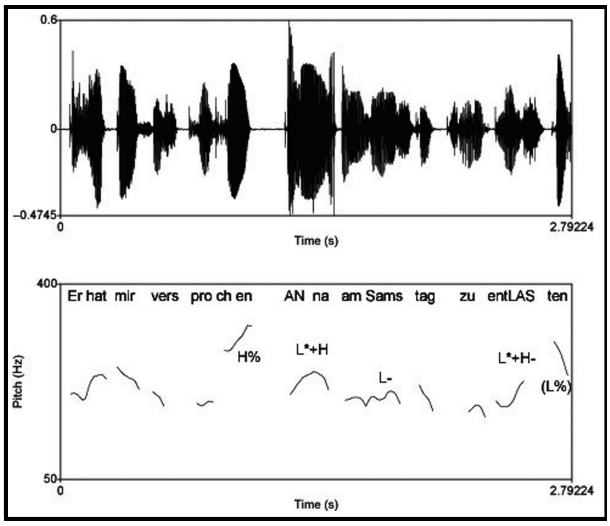

Figure 11: *Oscillogram and F0 course of one focus accented sentence from condition NEW for illustration.*

Figure 12 and *Table 25* (Appendix A), on the other hand, exhibit the averaged F0 values of the forty-four focus accent bearing sentences per condition (correction of the noun = COR; novelty on the noun and the verb = NEW). All displayed F0 values and their corresponding time points in *Figure 12* are derived from computations

described in section 3.3.2. The phonological annotation again follows the framework introduced in the end of section 2.1, and complies with the more reliable *averaged* F0 contours.

Both conditions (COR and NEW) display a high early accent in the matrix clause ("Er hat mir versprochen"). Thus, the speaker does not employ prefocal deaccentuation for the corrective intonation. Moreover, the last syllable of the matrix clause bears a high tone in both conditions. Due to the decisive tone movement on that syllable, the lack of durational differences between conditions, and the long pause following the matrix clause, the high tone is interpreted as the boundary tone of an IPh (H%). In general, the F0 range of the speaker for Experiment II is far more compressed than the F0 range of the speaker for Experiment I. Moreover, the F0 peak heights show an inverted picture than in Experiment I (see section 4.3.2). Thereby, condition NEW displays a higher peak than condition COR.

Yet, the *focus accent types* in noun position ("Anna") are quite similar in both conditions and comparable between Experiment I and II. In detail, the focus accent on the noun ("Anna") in condition COR can be transcribed as a bitonal H*+L accent. As in Experiment I, a high tone is apparent in the syllable with primary stress followed by a steep fall within the second syllable. In condition NEW, on the other hand, the high accent peak is again postponed to the second syllable. As follows, the accent on the noun ("Anna") in condition NEW is annotated as a bitonal L*+H accent.

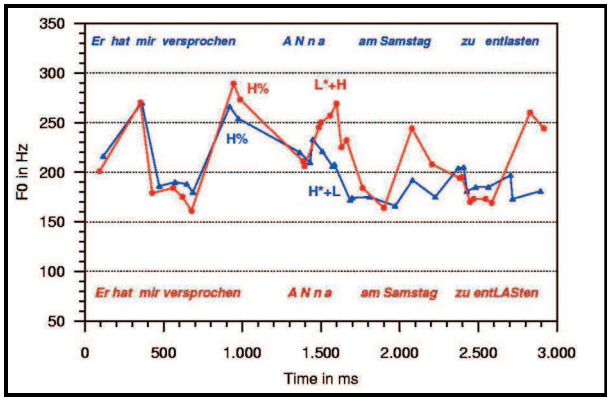

Figure 12: *F0 pattern in the third sentences (without conjunction clause) of Experiment II. Capitals signal accent positions. The blue line depicts the F0 course for correction focus on the noun (COR) while the red line indicates the F0 course for novelty focus on the noun and the verb (NEW).*

Considering the "permutation" of the F0 peak heights, it has to be noted that the novelty accent (NEW) is indeed produced approx. 50 Hz higher (≈ 3 semitones of the speaker's F0 range) than the correction accent (COR). Rietveld & Gussenhoven (1985) even identified a minimum threshold of 1.5 semitones in fluent speech as sufficient for the prominence differentiation of accent peaks.

However, the further F0 course in condition COR reveals that the particular speaker strongly employs postfocal deaccentuation. None of the sentence constituents following the focused noun ("Anna") display any high pitch targets (i.e. the contextually given temporal adjunct and the verb). Thus, the corrected noun is rendered salient solely within the IPh surrounding it ("Anna am Samstag zu entlasten") but not throughout the complete sentence. Due to the concurrent declination of the verb, the overall F0 contour up to the right edge of the verb is transcribed as a low L-L% pattern.

In condition NEW, on the other hand, the sentence constituents following the noun do not exhibit a deaccented pattern. A high secondary accent is apparent on the temporal adjunct which is rather unexpected due to the givenness of this constituent (and, moreover, not visible in *Figure 11*). However, as the phonological annotation is primarily based on the averaged F0 contours it is proposed that the high peak in the adjunct position is equivalent to a high phrase tone (H-). This realisation is proposed to render the salience of the following novelty focus on the verb ("zu entlasten"). The accent on the verb displays a rising pattern which starts out low, however. It can be transcribed (by additionally considering *Figure 11*) as a rising L*+H-H% pattern. As can be noted, the right edge of the verb is marked by a high IPh boundary tone (H%).

5.4 Experimental data

Twenty-one volunteers took part in the ERP experiment (11 female). Their mean age was 24.9 years (sd 2.2). All were right-handed (Oldfield, 1971), and without any known neurological or hearing disorders. None of them had participated in Experiment I.

During the EEG recordings, they were auditorily presented with 176 dialogue trials (44 per condition). After each trial, they had to judge whether the intonation contour of the last sentence was appropriate with respect to a preceding context (see section 3.3.3 for details).

5.4.1 Behavioural results

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction	Correction (CC) = 89.4 %	* Novelty (CN) = 80.8 %
Novelty	Novelty (NN) = 84.7 %	* Correction (NC) = 51.1 %

Table 13: *Correct answers per condition in Experiment II. The star (*) signals the inappropriateness of a pragmatic and a prosodic focus structure.*

As indicated in *Table 13*, participants judged both conditions with congruent pragmatic and prosodic foci (correction = CC; novelty = NN) as matching in more than 89 % (condition CC), respective 84 % (condition NN) of the overall experimental trials.

Moreover, listeners are also well able to detect the mismatch when a context implies a correction focus which is presented with the accentuation of novelty (CN; above 80 %). On the other hand, the prosodic pattern of a correction focus in novelty context (NC) is hard to perceive by listeners. Here, the correct answers decrease to 51.1 %.

5.4.2 ERPs to correction accentuation

Figure 13 displays the averaged ERP data for the 21 participants in Experiment II when processing the third sentences of the dialogues. Moreover, the figure illustrates the brain responses to the prosodic realisations of corrections. Thus, only the context preceding the accentuation patterns differs between conditions.

The solid lines depict the ERPs to the processing of correction accentuation that matches the preceding context (condition CC). The dotted line, on the other hand, illustrates the ERPs when the pragmatic focus structure and actual accentuation are in conflict. Here, the pragmatic focus ascertains novelty while the prosodic properties are those of correction focus (condition NC). Furthermore, the left part of *Figure 13* displays the ERPs as averaged from the onsets of the focus accent bearing sentences. The right part, in contrast, depicts the same calculation, however, with an average onset just before the focused noun (“Anna”). The general results of the statistical analyses can be found in *Table 30* of Appendix A.

Descriptively, a centro-posterior positive waveform (CPS) is evident which is strongest at posterior electrodes. In condition CC, it starts at approx. 500 msec post offset of the matrix clause (see right part of *Figure 13*), and in condition NC it begins at approx. 600 msec. Furthermore, the amplitude of the potential is higher for condition CC. For condition CC, this ERP sustains for about 1400 msec. In condition NC, on the other hand, the waveform reaches negative voltage values again after approx. 800 msec. However, condition NC displays a second positive deflection (CPS) starting at about 1900 msec post matrix clause offset which lasts for approx. 600 msec.

The statistical analyses for the comparison of the ERPs to condition CC vs. NC show an interaction Condition x Hemisphere ($F(1,20)= 6.59$; $p\leq.05$) in the TW between 0-500 msec. Its decomposition does not reveal a significant effect Condition in any hemisphere. In the consecutive TW of 500-1000 msec a main effect Condition ($F(1,20)= 17.62$; $p\leq.01$) is manifested. In addition, the TW between 1000-1500 msec reveals an effect Condition ($F(1,20)= 7.78$; $p\leq.05$). The following TW from 1500-2000 msec exhibits a three-way interaction of the factors Condition x Hemisphere x Region ($F(2,40)= 6.43$; $p\leq.01$). Its decomposition resu lts in a main effect Condition in the right posterior ROI ($F(1,20)= 6.78$; $p\leq.05$).

The TW between 2000-2500 msec again yields a three-way interaction ($F(2,40)= 7.14$; $p\leq.01$) which, however, cannot be deco mposed. The last TW, from 2500-3000 msec, exhibits a three-way interaction of the factors Condition x Hemisphere x Region ($F(2,40)= 6.32$; $p\leq.05$). Its deco mposition reveals an effect Condition in the left anterior ROI ($F(1,20)= 6.52$; $p\leq.05$).

Figure 14 serves to illustrate the electrophysiological responses to correction accentuation in adequate contexts (condition CC; top row) vs. inadequate contexts (condition NC; bottom row) in form of voltage changes across the scalp in three representative time windows (compared to the right part of *Figure 13*). The maps are computed from the same underlying data points as the ERP plots. They are supposed to confirm the separation of the two positive deflections as evoked by condition NC as opposed to a single positivity to the processing of condition CC. As in Experiment I, the statistical analyses fail to prove this argument.

As in Experiment I, the electro-cortical maps reveal that a pragmatic correction focus with a matching accentuation (condition CC) evokes one sustained posterior

positive high voltage deflection throughout all three considered TW. When the context implies novelty focus with is presented with the accentuation of corrections (as in condition NC), on the other hand, the first TW (900-1100 msec) depicts a posterior positivity which is interrupted in the second TW (1800-1900 msec). Within the third TW (2000-2200 msec), however, the positivity is apparent again. Overall, the amplitudes of the positivities to condition NC are less pronounced than the voltage amplitude to the perception of condition CC.

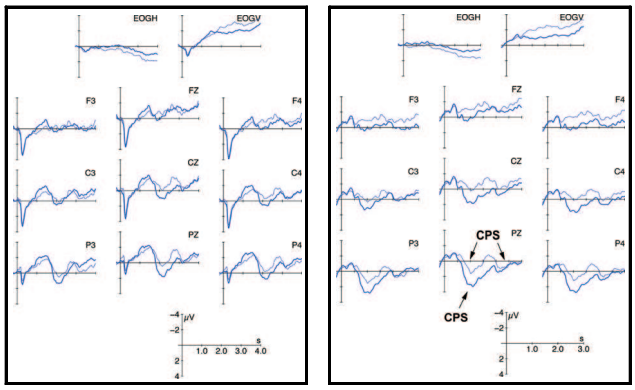

Figure 13: *ERPs (5 Hz low-pass filtered) from nine representative electrodes to the presentation of correction accents (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (CC), and the dotted line in non-matching context (NC).*

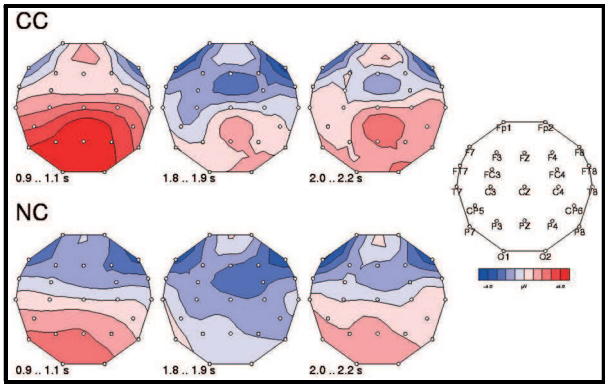

Figure 14**:** *Electro-cortical maps of the varying positivity pattern for the conditions CC and NC in TW of 900-1100 msec (left), 1800-1900 msec (middle) und 2000-2200 msec (right). The reddish colours mark positive-going voltage shifts whereas the bluish shades signal negative-going voltage shifts.*

Taken together, the voltage variation between condition CC and NC demonstrates that the context which gives rise to one pragmatic correction focus in noun position (condition CC; ”Anna”) elicits one strong posterior positive shift when the focus position is perceived. On the contrary, the context promoting two pragmatic novelty foci in noun and verb position (condition NC; “Anna”, “zu entlasten”) evokes two weaker posterior positive deflections when both of these foci are processed.

5.4.3 ERPs to novelty accentuation

Figure 15 again displays the ERP data of 21 participants when processing the third sentences of the dialogues. In detail, the figure visualises the brain responses to the prosodic realisations of novelty. As a consequence, only the context preceding the accentuation patterns differs but not the actual intonation of the sentence conditions.

The solid lines depict the ERPs to the processing of novelty accentuation matching the preceding context (condition NN). The dotted line, on the other hand, illustrates the ERPs when the pragmatic information and the actual realisation are in conflict. In particular, the pragmatic focus induces a correction while the prosodic properties are those of novelty focus (condition CN). The left part of *Figure 15* displays the ERPs as averaged from the beginnings of the focus accent bearing sentences. The right part, in contrast, depicts the same computation with an average onset just before the focused noun (i.e. “Anna”), namely at the end of the matrix clause.

The general results of the statistical analyses can be found in *Table 30* of Appendix A.

In the left part of *Figure 15* a centro-posterior negative shift (NEG) is displayed for condition CN which is strongest at posterior electrodes. This ERP starts at approx. 800 msec post sentence onset and lasts for about 900 msec.

The right part of *Figure 15* depicts the ERPs averaged to the offset of the matrix clause. In detail, condition NN (solid line) shows two posterior positive waveforms (CPS). The first positivity starts at 800 msec and a second one at approx. 1800 msec post matrix clause offset. Condition CN (dotted line) only displays one positive deflection (CPS) starting at about 600 msec post matrix clause offset. Notwithstanding, the amplitude of the positivity in condition CN is higher than for condition NN.

For the statistical estimation of the negativity after sentence onset the TW between 1100-1600 msec was chosen. In this TW, a main effect Condition ($F(1,20)= 11.82$; $p \leq .01$) could be proven.

The consecutively analysed TWs of 500 msec post offset of the matrix clause reveal a first main effect Condition in the TW 0-500 msec ($F(1,20)= 5.16$; $p \leq .05$). An additional two-way interaction of the factors Condition x Region ($F(2,40)= 5.93$; $p \leq .05$) could be decomposed, and confirms an effect Con dition in the anterior ($F(1,20)= 9.59$; $p \leq .01$) and in the central ROI ($F(1 ,20)= 4.68$; $p \leq .05$). A main effect Condition is also apparent in the TW of 500-1000 msec ($F(1,20)= 8.05$; $p \leq .01$). Furthermore, this TW comprises a three-way interaction of the factors Condition x Hemisphere x Region ($F(2,40)= 5.75$; $p \leq .01$) whose deco mposition reveals effects Condition in the following ROIs: left central ($F(1,20)= 6.36$; $p \leq .05$), left posterior ($F(1,20)= 13.99$; $p \leq .01$), and right posterior ($F(1,2 0)= 12.94$; $p \leq .01$).

The TW between 1000-1500 msec yields a main effect Condition ($F(1,20)= 15.80$; $p \leq .01$), and a three-way interaction ($F(2,40)= 12.01$; $p \leq .01$). After decomposing the latter, effects Conditions are apparent in the left anterior ($F(1,20)= 7.89$; $p \leq .05$), the left central ($F(1,20)= 14.84$; $p \leq .01$), the right cen tral ($F(1,20)= 13.26$; $p \leq .01$), the left posterior ($F(1,20)= 21.05$; $p \leq .01$), and in the right posterior ROI ($F(1,20)= 24.79$; $p \leq .01$).

Considering the TW from 1500-2000 msec, a main effect Condition is manifested ($F(1,20)= 6.58$; $p \leq .05$) together with a three-way i nteraction of the factors Condition x Hemisphere x Region ($F(2,40)= 12.17$; $p \leq .01$). It ref lects the distribution of an effect Condition to the left central ($F(1,20)= 6.94$; $p \leq .05$), the right central ($F(1,20)= 5.24$; $p \leq .05$), the left posterior ($F(1,20)= 13.48$; $p \leq .01$) , and in the right posterior ROI ($F(1,20)= 17.09$; $p \leq .01$).

The consecutive TW from 2000-2500 msec displays a three-way interaction ($F(2,40)= 12.07$; $p \leq .01$) whose decomposition proves eff ects Condition in the left posterior ($F(1,20)= 4.93$; $p \leq .05$), and in the right posterior ROI ($F(1,20)= 4.80$; $p \leq .05$).

The last estimated TW between 2500-3000 msec again shows a three-way interaction ($F(2,40)= 8.65$; $p \leq .01$). By decomposing it , an effect Condition becomes apparent in the left anterior ROI ($F(1,20)= 5.21$; $p \leq .05$).

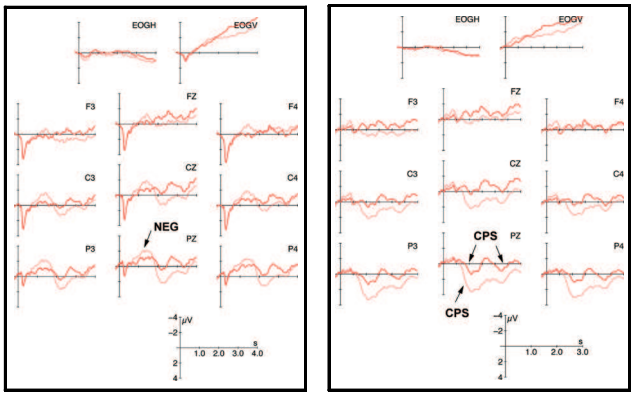

Figure 15: *ERPs (5 Hz low-pass filtered) to the presentation of novelty accents (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (NN), and the dotted line in non-matching context (CN).*

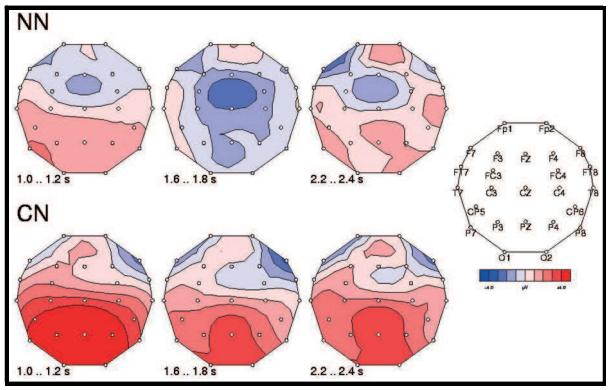

Figure 16**:** *Illustration of the differences in the positivity pattern between the conditions NN and CN in TW of 1000-1200 msec (left), 1600-1800 msec (middle) and 2200-2400 msec (right). The reddish colours mark positive-going voltage shifts whereas the bluish shades signal negative-going voltage shifts.*

Figure 16 visualises the ERP responses to novelty accentuation in adequate contexts (condition NN; top row) vs. inadequate contexts (condition CN; bottom row) in form of voltage changes in three representative time windows (related to the right part of *Figure 15*). The maps shall provide further evidence for the context-dependent elicitation of the positive brain deflections.

Notably, they reveal that the presentation of pragmatic novelty focus with a matching accentuation (condition NN) elicits two separate positive brain deflections. The first considered TW (1000-1200 msec) displays a posterior positivity which is

intersected in the second TW (1600-1800 msec), and resumed in the third TW (2200-2400 msec).

In contrast, a pragmatic correction focus presented with the accentuation of novelty (condition CN) induces only one, however high voltage, positivity throughout all TWs.

Thus, although the statistical results do not provide statistical arguments, the voltage changes for the conditions NN and CN reveal that the context solely implying a pragmatic correction focus in noun position (condition CN; i.e. ”Anna”) induces one strong positivity due to the perception of the noun in focus. In contrast, the context which releases two pragmatic novelty foci in noun and verb position (condition NN; i.e. “Anna”, “zu entlasten”) elicits two, however weaker, positive deflections when these focus positions are encountered.

5.5 Summary and discussion of Experiment II

Experiment II was once more concerned with the prosodic realisation and perception of novelty vs. correction focus. As opposed to Experiment I, the insertion of a temporal adjunct (“am Samstag”) served to separate the two focus positions on the noun and the verb (“Anna”, “zu entlasten”) ensued from the novelty context.

The acoustic analyses of the speech materials for Experiment II reveal that the focus accent types of correction and novelty are comparable to productions of the speaker for Experiment I. In detail, the correction focus on the noun (“Anna”) can be annotated as an H*+L accent in terms of GToBI (Grice & Baumann, 2002). The novelty accents on the noun (“Anna”) and the verb (“zu entlasten”), on the other hand, can be transcribed as L*+H accents. These annotations are, as in Experiment I, based on the alignment of the noun’s primary stress (always trochaic) and the high accent peak. While for the correction accent (H*+L) the primarily stressed syllable and the accent peak in noun position are aligned, the peak of the novelty accent is postponed to the second syllable.

Thus, the expectations (see section 5.2) with respect to intonational differences as well as to the particular accent types on corrective and novelty information are corroborated.

However, the actual pitch peak height of the novelty accent on the noun as opposed to the correction accent displays a diverging pattern. While in Experiment I the peak was higher in the correction accent, in Experiment II the F0 peak of the novelty accent tops the F0 peak on the corrected element.

Furthermore, the speaker of the materials for Experiment II only employs postfocal deaccentuation within the IPh comprising the actual correction accent (Féry, 1993). Hence, the assumption of general prefocal deaccentuation preceding correction accents must be dismissed. Moreover, the contextually given temporal adjunct ("am Samstag") is not deaccented when surrounded by novelty information. In detail, the adjunct conveys a high tone (H-) which was interpreted to increase the salience of the adjacent low-starting verb accent (L*+H). Thus, the assumption of conventional deaccentuation of given or [-focus] information stated in section 5.2 does not hold.

In agreement with the hypotheses on the behavioural results, listeners are well able to judge the appropriateness of dialogues conveying matching focus – accentuation combinations (condition CC and NN). Participants` behaviour shows a strong similarity to the results gained in Experiment I (see section 4.4). Moreover, this similarity is reflected in the correct answers to condition CN. As in Experiment I and in congruence with the current hypotheses, novelty accentuation in contexts prompting the correction of the noun ("Anna") is refused in most of the trials. Furthermore, the inappropriate correction accent in a context motivating novelty on the noun and the verb (condition NC) is, as in Experiment I, not consistently rejected. Notably, participants` behavioural results in condition NC are even worse than in Experiment I.

In accordance with the acoustic analyses, this outcome cannot solely be interpreted as a detection mechanism for underspecified accents vs. accommodation to overspecified accents (Alter et al., 2001) as both accent types (novelty and correction) were shown to comprise bitonal patterns. Instead, it is proposed that the explanation offered in the discussion of Experiment I can once more account for the behaviour of the participants. In particular, the high F0 peak of the correction accent is realised within the primarily stressed syllable of the noun ("Anna"). The novelty accent peak, on the other hand, is postponed to the second syllable of the noun which does not bear primary stress. Following Gussenhoven (2004) it is proposed that the correction accent (H*+L) can be interpreted in an ambiguous fashion due to

the alignment of stress and accent peak. The novelty accent (L*+H), on the other hand, cannot be interchanged with the correction accent since the trochaic stress pattern and accent peak are not aligned. In turn, this leads to the strong rejection of condition CN by the listeners but to a more unhesitant acceptance of condition NC.

These behavioural findings are further corroborated by the electrophysiological data (see section 5.4). Condition CN (with an accentuation signalling novel information in a context indicating the correction of the noun) displays a centro-posterior negative ERP (NEG) which is significant in the TW from 1100-1600 msec post sentence onset. As in Experiment I, this negativity starts out before the actual novelty accentuation on the noun ("Anna") is encountered. In Experiment I, the premature onset of this negativity could be accounted for by the apparent prefocal deaccentuation in the production of the corrective intonation as opposed to novelty. However, the speech data of Experiment II did not reveal any prefocal deaccentuation for the matrix clause ("Er hat mir versprochen").

Yet, a more fine-grained analysis of the prosodic properties of the matrix clause reveals substantial differences between the conditions COR and NEW. The last syllable of the matrix clause (see section 3.3.2) displays a considerably larger F0 excursion for condition NEW. In condition NEW, the speaker produced this IPh-final syllable with an excursion of 130 Hz (≈ 7.9 semitones of her overall register) while she only utilises 80 Hz (≈ 4.9 semitones) in condition COR. Thus, it is suggested that listeners interpret these varying F0 excursion cues before the actual focus accent position (i.e. "Anna") is processed. As mentioned beforehand, the work of Rietveld & Gussenhoven (1985) strongly supports the assumption that F0 excursions play a greater role than absolute pitch peak heights in intonation perception. Their findings on the importance of F0 excursions in intonation perception thus provide an explanation for the early onset of the negativity (NEG) in the current ERP data. Moreover, their findings on the neglect of absolute pitch peak heights can account for missing behavioural and ERP effects due to the so-called "permutation" of the F0 peak heights between novelty and correction accents on the noun ("Anna").

However, the absolute duration of the negative-going ERP to the perception of condition CN also suggests that the actual noun focus accent contributes to the elicitation of the component. As proposed in the discussion of Experiment I (see section 4.5), the confinement of the negative ERP to the perception of condition CN

is accounted for by Gussenhoven`s (2004) findings on the alignment of lexical stress and high accent peaks. In detail, Gussenhoven assumes that a precisely articulated accent with its pitch peak aligned to the lexically stressed syllable is appropriate in any environment (e.g. correction and novelty context). On the other hand, sloppily produced accents with non-aligned stress and accent peaks cannot signal contrastiveness. Hence, the correction accent (H*+L) in novelty context (i.e. condition NC) can be ambiguously interpreted. On the other hand, the novelty accent (L*+H) in correction context (i.e. condition CN) fails to signal a corrective meaning. As a result, a negative deflection is only evoked by the perception of the non-aligned novelty accent in a pragmatic construction implying correction (condition CN).

As in Experiment I, the eliciting factors of the centro-posterior positivity are, however, different ones. In the conditions where the novelty context gives rise to two pragmatic focus positions on the noun (“Anna”) and the verb (“zu entlasten”) two posterior positive shifts reflect the processing of these foci (i.e. conditions NN and NC). Moreover, the context which promotes a pragmatic correction focus on the noun (“Anna”) reveals one sustained high amplitude positive shift (i.e. conditions CC and CN).

In accordance with Experiment I, these positive ERP deflections are interpreted as focus-induced Closure Positive Shifts (CPS) based on the latency, the scalp distribution, the morphology, and the evoking conditions (Hruska, 2004; Hruska et al., 2004).

Furthermore, the CPS responses do not seem to be influenced by the appropriateness of the focus – accentuation combinations. Condition NC evokes two positive deflections in noun and verb position (“Anna”, “zu entlasten”) irrespective of the prosodic focus which signals a correction only in noun position. Condition CN, on the other hand, elicits only one positive waveform to the corrected noun (“Anna”) although the accentuation signals novelty in noun and verb position (i.e. no deaccentuation of the verb). Thus, each of the two proposed novelty focus positions yields a separate deflection. As opposed to Experiment I, these deflections are more clearly separable on a descriptive basis. However, the statistical analyses again fail to prove the distinctiveness of the two CPS responses. Hence, the hypothesis (see section 5.2) that the insertion of a contextually given temporal adjunct (“am Samstag”) enables the proof of statistical differences between the first CPS (elicited by the noun) and the second CPS (evoked by the verb) has to be rejected. The

voltage amplitude of the CPS to the pragmatic correction focus (in the particular comparison between condition NN and CN; see section 5.4.3) is so strong that the TW between both CPS still reveals significant differences between conditions.

In accordance with the stated hypotheses and with the results of Experiment I, the Closure Positive Shift (CPS) was validated as a reliable electrophysiological response to the information structural processing of dialogues. Contexts implying a correction focus in noun position (conditions CC and CN) continuously elicit one CPS when the noun position (“Anna”) is processed. Moreover, contexts which induce novel information foci on the noun and the verb (condition NN and NC) reveal two distinctive CPS responses in temporal reliance on each of the both positions (“Anna”, “zu entlasten”).

In addition, it could be shown that the CPS is autonomous of the appropriateness of pragmatic focus – prosodic focus associations.

However, an influence of the appropriate accentuation of pragmatic focus positions with respect to a certain context is reflected by an early centro-posterior negative waveform (NEG). In particular, it can be statistically proven when the context promotes a correction focus but the accentuation signals novelty (i.e. condition CN). The temporal dimensions of this negativity yet lead to the conclusion that subjects not only interpret the focus accent mismatch in noun position. Obviously, the prefocal accentuation patterns do matter as well. As the speech materials for Experiment II do not exhibit prefocal deaccentuation within the matrix clause (“Er hat mir versprochen”) in condition COR, more fine-grained cues to the interpretation of the prefocal accentuation have been examined. In particular, the fortitude of the F0 excursion within the matrix clause was proposed to provide cues as to the kind of an upcoming focus position. In particular, the F0 excursion preceding prosodic correction focus was found to be more compressed than the excursion preceding the realisation of novelty.

Moreover, the observation that only condition CN (with the stronger compressed F0 and misaligned stress and accent peaks in noun position) results in a negative-going ERP is in line with the behavioural data and the hypotheses as stated in section 5.2. On the contrary, condition NC (conveying a more pronounced F0 range and aligned stress and accent peaks) does not elicit an ERP, and, as the behavioural data reveal, is more readily but falsely accepted by listeners.

6 Experiment III: Correction focus vs. Contrastive topics

Experiment III was concerned with the intonational realisation of utterances incorporating correction foci and contrastive topics. Furthermore, it was examined how pragmatic and prosodic correction foci vs. contrastive topic information is perceived in German. Special attention received the question whether the Closure Positive Shift (CPS) as an electrophysiological marker of information structural processing is elicited exclusively by sentence elements with focal status as opposed to topic-hood. Furthermore, the consequences of inappropriate associations between the contextually construed, thus pragmatic, information status and the accentuation of sentence constituents, hence their prosodic status, were to be evaluated.

Topics in information structural designate the theme of an utterance, i.e. propositions established by a certain discourse. Topic information is generally seen as a part of the background of a sentence as they do not add any further relevant information to the discourse. Moreover, they are being attributed an optional character within the formation of utterances (see section 2.3.3).

Contrastive information in discourse occurs either in the focus positions of a sentence (as e.g. correction foci) or in sentence positions that are associated with topics (i.e. the verbal pre-position in German).

Due to the pragmatic function of contrastiveness, namely singling out an alternative from a set of propositions, some authors tend to merge the categories of contrastive focus and contrastive topic (e.g. the notion of "*kontrast*" of Gundel & Fredheim, 2004). Molnár (2002) states in this regard that contrast signals an "*autonomous phenomenon of information structure"* (p. 156) with the consequence of an "*overlap* [of] *topicality and focusing in different ways*".

However, such interpretations are often motivated by the intonational commonalities of contrastive topics and foci. For example, Pierrehumbert & Hirschberg (1990: 296f.) state that an L+H* accent is employed to *"… convey that the accented item – and not some alternative related item – should be mutually believed"*. This assumption can indeed account for both information types: contrastive topics and foci. In the slightly different analysis of Hobbs (1990), however, the L+H* would imply that *"… you might think this information is not new, but it really is new"* (p. 314). Hence, his proposal rather indicates that an L+H* accent is

interpreted as a contrastive focus but not as part of the topic information. Yet, as indicated in section 2.4, considerable differences are apparent in the literature on, inter alia, focus and topic accent properties in English vs. German. Furthermore, there is so far no consensus as to whether contrastive topics are indeed part of the topic information of sentences, and what kinds of topics are counted among contrastive topics. Thus, to avoid confusion and to further specify the type of contrastive topics under investigation in Experiment III, the discussion will be narrowed down to the literature and attributes of the so-called *i-topics.* Moreover, the argumentation will mainly be adjusted to literature on German. The notion of intonational topics (abbrev: i-topics) was employed first by Jacobs (1982). By using the term *i-topic*, Jacobs referred to a subgroup of topics which are intonationally marked in a salient way. The "i" thus denotes the special impact of intonation in the spoken transmission of these utterances. Jacobs (1996) and Büring (1997) suggest several criteria to differentiate i-topics from other kinds of topic and focus information. These criteria are listed below.

- I-topics can only appear within assertions (and are ungrammatical in interrogatives and exclamatives; Jacobs, 1996: 5).
- Prototypical i-topics are situated in sentence positions of the German verbal pre-position or similar positions (Jacobs, 1996: 13).
- The position of an i-topic must be lexically filled with a constituent that can have an alternative (hence, can be contrasted; Jacobs, 1996: 7).
- I-topics can be formed by discourse topic information which has been introduced by a preceding context to "*narrow down*" the set of the previously established propositions (Büring, 1997: 56).
- An i-topicalised constituent can convey information which is attributable to the focus of the sentence as indicated by question tests (Jacobs, 1996: 13).
- The intonation pattern on the i-topic is a fall-rise contour called *"Wurzelkontour"* (Jacobs, 1996: 2, with reference to Uhmann, 1991) or can be transcribed in terms of ToBI as L*+H for German (Büring, 1997: 60, with reference to Féry, 1993: 151f.)[1].

[1] Hobbs (1990: 317) states for the L*+H accent that the information conveyed *"… shouldn't be taken as relevant mutual knowledge until it can be considered further".* This interpretation seems to be suitable for i-topics, too, as they can be constituted by subsets of formerly stated propositions.

As stated in the listing, the i-topic positions within German sentences always precede the actual focus positions. Since i-topics (the theme of an utterance) are implicitly related to the focus of utterances (what is stated about the theme), they form an internal bond with the actual focus positions. This inferential relationship is realised intonationally by own means. In detail, the i-topic accent (L*+H) constitutes a concise F0 contour in relation to the subsequent focus accent. The actual accent on the focus information can, however, differ depending on whether the focus conveys e.g. novel discourse information (H* or rising L+H* accent) or corrected information (falling H*+L accent). The prosodic pattern which is constituted by the combination of the high (or rising) accent with a consecutive falling accent has been termed *hat pattern* (Cohen & `t Hart, 1967) or *bridge accent two* (Féry, 1993: 151, with reference to Wunderlich, 1988: 12). Recent work by Steube (2001b) proposes that the semantic contribution of contrastive accents within bridge contours and in corrections is equal. Steube attributes the differences between these particular contrastive accents exclusively to the precise context evoking them, and to distributional constraints for focus and topic information within sentential constructions. In her opinion, the extraposition of the i-topic to the non-focus domain (verbal pre-position) is solely due to phonological reasons. Steube proposes that the salience of an i-topic accent is greatly increased in this topicalised position whereas the adjacency of focus and i-topic accents would rather decrease the markedness of one or even both accents.

To conclude, two general view points can be derived as to the status of i-topics in information structure. From a syntactic-pragmatic perspective, i-topics are supposed to share their characteristics with the usual thematic or topic information within utterances. In particular, they mainly appear in the verbal pre-position in German sentences and are derivable from previously mentioned propositions. However, from an intonational perspective i-topics rather share the prosodic properties of rhematic contrastive focus information. First, they convey specific prosodic markings (L*+H) and second, these markings give rise to a contrastive interpretation of the topic information. Thus, they establish a contrast set as contrastive focus information does, respectively.

Accordingly, Experiment III was designed to examine the prosodic properties of two types of contrastive information, namely i-topics as opposed to correction focus.

Furthermore, the ascertained psychophysiological marker for the processing of focal information, the Closure Positive Shift (CPS), is employed to determine the status of i-topics as thematic (as suggested by their syntactic-pragmatic properties) or rhematic information (as suggested by their intonational properties) in discourse.

6.1 Materials

Table 14 illustrates the formation of the dialogue conditions for Experiment III. As in the previously reported experiments, each dialogue consists of three sentences.

CORRECTION FOCUS (COR)	A: Am Samstag hat Peter mir etwas versprochen. *On Saturday Peter promised me something.* B: Hat er Dir versprochen, Frauke zu entlasten? *Did he promise Frauke to support?* **A: Er hat mir versprochen, [Anna]$_{COR}$ zu entlasten** **[und die Küche zu putzen.]$_{NEW}$** *He promised Anna to support and the kitchen to clean.*
I-TOPIC (ITOP)	A: Am Samstag hat Peter mir etwas versprochen. *On Saturday Peter promised me something.* B: Hat er Dir versprochen, Deine Freunde zu beanspruchen? *Did he promise your friends to strain?* **A: Er hat mir versprochen, [Anna]$_{ITOP}$ [zu entlasten]$_{COR}$** **und [Claudia]$_{ITOP}$[zu befreien]$_{NEW}$.** *He promised Anna to support and Claudia to liberate.*

***Table 14*:** *Examples of the materials used in Experiment III (with literal translations). Sentences in bold type entered the acoustic analyses.*

In the critical third sentence of with correction accentuation (condition COR) the noun “Anna” is contrasted with the noun “Frauke” from the preceding question. Hereby, a correction focus is established only on “Anna” as all other constituents (apart from the conjunction clause) are contextually given.

Condition ITOP, on the other hand, conveys a divisible proposition in the question preceding the third sentence. In detail, a group of people is introduced (see Appendix C) which minimally consists of two entities (e.g. grandparents). In the following contrastively accented sentence this set of entities is narrowed down. As a

consequence, two entities are singled out from the proposition (i.e. the nouns “Anna” and “Claudia”). These in turn establish topics which obligatorily have to be prosodically marked as i-topics. Yet, the i-topic + novel verb construction (“Claudia”, “zu befreien”) in the conjunction clause will not be considered further as it was inserted due to restrictions of the ERP methodology. However, the existence of the second i-topic (on “Claudia”) within the conjunction clause is supposed to strengthen the proposition subset interpretation of both nouns, too.

Of great interest, on the other hand, is the i-topic (“Anna”) in the same sentence position as the correction focus (“Anna”) in condition COR. Moreover, condition ITOP conveys a correction focus on the verb (“zu entlasten”). To assure this contrast in verb position, only explicit antonyms were employed (from Bulitta, 1997).

The complete materials for Experiment III can be found in Appendix C.

The critical accent bearing sentences (*Table 14*) were produced by the same speaker as in Experiment I. Since the speech materials of condition COR have already been examined in Experiment I, the current acoustic analyses will be more concerned with the intonational realisation of condition ITOP. In particular, the prosodic properties of the noun in i-topic position (“Anna”) and of the verb in correction focus position (“zu entlasten”) will be considered in detail.

From a perception perspective, the processing of contrastive information in focus vs. topic position can be evaluated. Thereby, electrophysiological correlates will be explored in situations where the pragmatic and the prosodic information sources equally subserve the interpretation of a discourse situation vs. when they are in conflict (*Table 15*).

For this purpose, two conditions with matching pragmatic and prosodic information structures (conditions CC and II) were presented to participants. Furthermore, two conditions with non-matching pragmatic and prosodic information sources (conditions CI and IC) were created by combining the two context sentences of one condition (COR or ITOP) with the contrastive accent bearing third sentence of the opposite condition (COR or ITOP, respectively).

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction (COR)	Correction (COR) in the critical sentence (condition CC)	* I-Topic (ITOP) in the critical sentence (condition CI)
I-Topic (ITOP)	I-Topic (ITOP) in the critical sentence (condition II)	* Correction (COR) in the critical sentence (condition IC)

Table 15: *Formation and annotation of the conditions in Experiment III. The star (*) signals the inappropriateness of a pragmatic and a prosodic focus structure.*

The condition annotation in *Table 15* as well as for the behavioural and ERP data is arranged as follows: The first letter of the condition name denotes the contextually determined (pragmatic) information structure ("C" for correction focus, and "I" for i-topics). A second letter then designates the actual contrastive accent realisation ("C" for correction accentuation of the noun, and "I" for the i-topic accentuation of the noun + the corrective accentuation of the verb). Thus, when the first and the second letter coincide, the pragmatic and the prosodic information are in concordance. Do both letters disagree, in contrast, the association of the pragmatic and the prosodic properties are in conflict.

For the analyses of the ERP data, always the conditions with identical intonational realisations but diverging pragmatic requirements will be compared. By this, confounded effects of the pragmatic and prosodic information structure can be withdrawn.

6.2 Questions and Hypotheses

Prosodic realisation

The prosodic realisation of the correction materials (COR) has already been discussed in Experiment I. The same dialogue productions were also employed for Experiment III.

However, the intonation pattern of condition ITOP is assumed to differ substantially from condition COR. Although both conditions convey a contrastive accent in noun position ("Anna") it is expected that the particular accent types differ. In detail, it is hypothesised that the contrastive accent on the i-topic is produced as a rising bitonal accent L*+H. Moreover, the consecutive verb in focus position ("zu

entlasten") is assumed to display a falling H*+L accent as described for the corrected information in Experiment I and II. However, since the verb is not a sentence-final element (but directly precedes the conjunction clause) the fall might not be realised at all. Notwithstanding, it is assumed that the accentuation on the noun and the consecutive verb constitute a *hat pattern* (Cohen & `t Hart, 1967) or, respectively, a *bridge accent two* (Féry, 1993).

Moreover, it is hypothesised that both conditions, COR and ITOP, exhibit deaccented F0 contours on the matrix clause ("Er hat mir versprochen") due to the contrastiveness of both accents.

Behavioural results

As for the behavioural results, it is hypothesised that participants are again well able to judge the condition with matching pragmatic and prosodic correction focus (condition CC) as matching. Similar positive responses are expected when a context establishes an i-topic relation in noun position ("Anna") and a correction focus on the verb ("zu entlasten"; condition II).

For the inappropriate associations between a certain context and a particular accentuation pattern, however, expectations are two-fold. First, it is unclear whether participants can differentiate between both contrastive accents on the noun ("Anna") at all. Yet, their proposed prosodic realisation as falling accents H*+L (correction) vs. rising accents L*+H (left edge of the assumed bridge contour or i-topic, respectively) might enable a distinction. Second, participants might ground their decisions on non-matching context-to-accentuation pairs rather on the prosodic realisation of the verb ("zu entlasten"). As reported in section 4.3.2 of Experiment I, the verb displays a deaccented F0 in condition COR since it is not focused. In condition ITOP of the present investigation, however, it is focused and expected to exhibit a correction accent (H*+L).

Thus, it is hypothesised that participants are well able to judge the non-matching combination of condition IC as its actual prosodic realisation lacks a correction accent on the verb ("zu entlasten") although ensued from the context. In contrast, condition CI is expected to be judged inconsistently since the accentuation pattern comprises a "superfluous" accent on the verb despite of its pragmatically induced status as non-focused information (see *Table 14*).

ERP data

In accordance with the ERP data obtained in Experiment I and II it is assumed that the elicitation of the CPS is again contextually triggered. Thus, whenever the critical sentences are preceded by a context inducing a correction focus on the noun (as in the conditions CC and CI) a CPS is expected to accompany the perception of the focused noun (“Anna”).

Moreover, a CPS is proposed to the processing of the verb (“zu entlasten”) when this is under correction focus. This requirement is fulfilled when the context ascertains a bridging construction between the noun and the verb position (as in the conditions II and IC). What remains unclear, however, is, whether the CPS is elicited to the perception of the actual i-topic in noun position (“Anna”). When the prosodic properties of i-topics contribute substantially to the status of i-topics as contrastive information in discourse, one might expect the elicitation of a CPS also to the i-topic in noun position. However, the CPS has been confirmed in Experiment I and II as a marker to the perception of rhematic (or pragmatically focused) information. As i-topics belong to the thematic part of an utterance from a syntactic-pragmatic perspective, it is proposed here that the processing of i-topics does not lead to a CPS deflection in noun position (“Anna”).

With respect to negative deflections in the ERPs, it is hypothesised in accordance with the results of Experiment I and II that an i-topic accentuation on the noun (“Anna”) in contexts the correction of the noun (condition CI) leads to a negative ERP. They are supposed to result from the detection of the non-alignment of the high accent peak and the primary stress of the noun with i-topic accentuation (the L*+H accent as described by Büring, 1997 and Féry, 1993).

Moreover, it is expected that a second negative deflection is evident in the unaccented verb position. This instance is caused when the context inducing a bridging relation between the i-topic (“Anna”) and the correction focus (“zu entlasten”) is combined with the actual corrective accentuation of the noun (condition IC). Thus, the verb position is then unexpectedly deaccented (see *Table 14*).

6.3 Acoustic and phonological analyses

6.3.1 Segment and pause durations

Figure 17 and *Table 22* (Appendix A) display the segment and pause durations within the third dialogue sentences of Experiment III, and statistical analyses of differences between the realisations of corrections on the noun (condition COR) vs. i-topic information on the noun combined with corrections on the verb (condition ITOP).

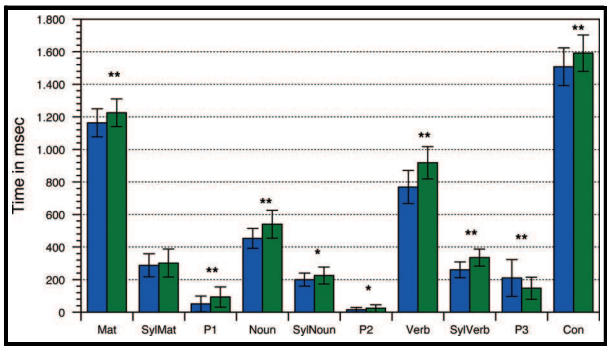

Figure 17: *Segment and pause durations in the critical accent bearing third sentences of Experiment III (*p .05; **p .01). The blue bars depict the r esults for corrections of the noun (COR), and the green bars for i-topic information on the noun followed by a corrected verb (ITOP).*

First of all, the global sentence length of condition ITOP is more extended that for condition COR (see *Table 22*). Furthermore, durational advantages for condition ITOP are exhibited by the matrix clause (Mat), the first pause (P1), the noun position (Noun) and its last syllable (SylNoun), the second pause (P2), as well as by the verb (Verb) and its last syllable (SylVerb). Thus, there is no indication for the manifestation of a correction focus by durational means in noun position (“Anna”; condition COR). In contrast, there is evidence that the correction focus on the verb (“zu entlasten”) extends the duration (condition ITOP) as opposed to contextual givenness (as in condition COR).

6.3.2 Analysis and phonological description of F0

For reasons of visualisation, *Figure 18* displays the F0 course of a representative single sentence with i-topic accentuation in noun position and the corrective realisation of the verb (condition ITOP).

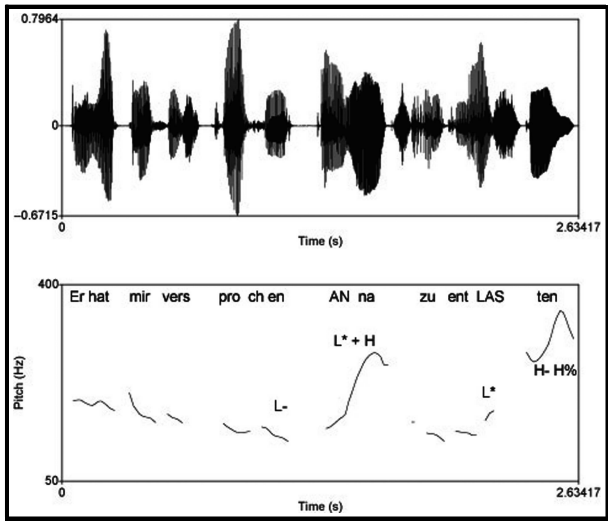

Figure 18: *Oscillogram and F0 course of one critical accent bearing sentence from condition ITOP for illustration.*

Figure 19 and *Table 26* (Appendix A), on the other hand, exhibit the averaged F0 values of the forty-four sentences per condition bearing contrastive intonation (correction of the noun = COR; i-topic on the noun and correction on the verb = ITOP). All displayed F0 values and their corresponding time points in *Figure 19* are derived from computations described in section 3.3.2. The phonological annotation follows the framework introduced in the end of section 2.1.

As apparent from *Figure 19*, both conditions (COR and ITOP) exhibit on the average a deaccented F0 pattern throughout the course of the matrix clause (“Er hat mir versprochen”). They are both proposed to end on a low phrase tone (L-).

In the position of the accented noun (“Anna”), condition COR displays a high F0 peak on the primary stressed syllable of the element. Hence, the high accentual peak is aligned with the primary stressed syllable of the noun. Thus, the F0 contour on the noun is transcribed as an H*+L accent. The focus accent (“Anna”) is followed by a low phrase accent realised on the verb (“zu entlasten”), and a low intonational boundary (L-L%).

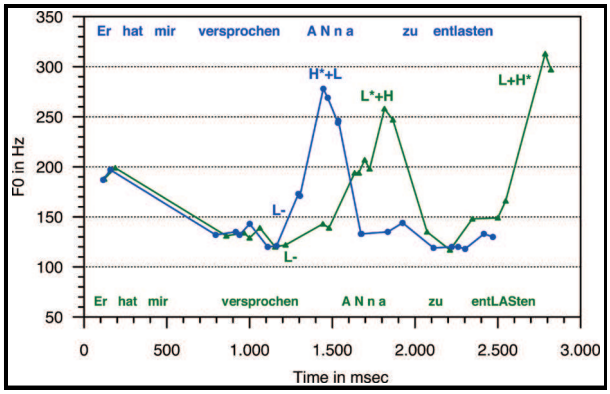

Figure 19: *F0 pattern in the third sentences (without conjunction clause) of Experiment I. Capitals signal accent positions. The blue line depicts the F0 course for correction focus on the noun (COR) while the green line indicates the F0 course for the i-topic realisation on the noun and the correction focus on the verb (ITOP).*

For condition ITOP, the prosodic realisation of the high accent peak in noun position (“Anna”) is delayed to the secondary stressed syllable of the noun. Hence, they are not aligned. Since the first syllable of the noun is produced with a low tone, the nuclear accent is transcribed as L*+H. Furthermore, an additional rising pattern is evident on the verb in correction focus (“zu entlasten”). To determine whether the high F0 peak at the right edge of the verb has to be interpreted as a focus accent or is simply a reflection of an IPh boundary, *Figure 18* has to be considered. By doing so, it becomes evident that the verb`s syllable with main stress (“entLASten”) conveys a low tone (L*). Towards the right edge, the F0 rises again. This pattern can hence be interpreted as the manifestation of a high prosodic boundary. Thus, the overall F0 contour on the verb is transcribed as L*+H-H%.

With respect to differences in the F0 peak heights, it can be noted that the correction accent (condition COR) is only slightly higher than the i-topic realisation in noun position (condition ITOP). The difference is about 20 Hz (≈ 0.75 semitones of the speaker’s range). Moreover, the overall F0 excursion in noun position (“Anna”) does not differ substantially between condition COR and ITOP.

In summary, both conditions conveying a contrastive accent in noun position (condition COR and ITOP) employ prenuclear deaccentuation. However, only condition COR utilises postnuclear deaccentuation of the verb to increase the salience of the correction accent in noun position. Moreover, the internal relation between the i-topic in noun position and the correction focus on the verb is not

manifested in a so-called *hat pattern* or *bridge accent* in condition ITOP. Instead, both contrastive accents display rising patterns with a low onset which are annotated as L*+H accents.

6.4 Experimental data

Twenty-one volunteers took part in the ERP experiment (11 female). Their mean age was 24.7 years (sd 2.5). All were right-handed (Oldfield, 1971), and without any known neurological or hearing disorders. None of them had taken part in one of the previous experiments.

During the EEG recordings, they were auditorily presented with 176 dialogue trials (44 per condition). After each trial, they had to judge whether the intonation contour of the last sentence was appropriate with respect to a preceding context (see section 3.3.3 for details).

6.4.1 Behavioural results

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction	Correction (CC) = 87.8 %	* I-Topic (CI) = 36.3 %
I-Topic + Correction	I-Topic (II) = 66.0 %	* Correction (IC) = 48.2 %

Table 16: *Correct answers per condition in Experiment III. The star (*) signals the inappropriateness of the pragmatic and the prosodic focus structure.*

As apparent from *Table 16*, participants judged the condition with congruent pragmatic and prosodic correction focus (condition CC) as matching in more than 87 % of the trials. This result replicates the behavioural findings from Experiment I and II.

However, the second condition with matching context - accentuation properties (condition II) was responded to correctly in only two-thirds of all answers.

Moreover, the conditions with non-matching context – accentuation patterns (conditions CI and IC) display a further decrease in correct answers. For the condition which pragmatically implies an i-topic in noun position which is then

realised as a correction focus (condition IC), the number of correct answers are around chance. Participants are still more inaccurate in judging the opposite association (condition CI), thus with a context promoting a correction focus on the noun which, however, displays the accentuation of an i-topic in noun position and a correction focus in verb position. Here, answers are solely correct in one-third of all trials.

6.4.2 ERPs to correction accentuation

Figure 20 displays the averaged ERP data of the 21 participants in Experiment I when processing the third sentences of the dialogues. Moreover, the figure solely visualises the brain responses to the prosodic realisations of corrections. Hence, only the context preceding the accentuation patterns actually differs.

The solid lines depict the ERPs to the processing of correction accentuation that matches the preceding context (condition CC). The dotted line, on the other hand, illustrates the ERPs when the pragmatic and the prosodic information are in conflict (condition IC). In condition IC, the pragmatic information determines an i-topic in noun position in conjunction with a correction focus in verb position. However, the prosodic properties are those of correction focus. Furthermore, the left part of *Figure 20* displays the ERPs as averaged from the beginnings of the correction accent bearing sentences. The right part, in contrast, depicts the same computation with an average onset just before the noun with correction accentuation (“Anna”).

The general results of the statistical analyses can be found in *Table 31* of Appendix A.

Descriptively, the right part of *Figure 20* displays a high amplitude positive waveform (CPS) for condition CC starting at approx. 500 msec post matrix offset which is strongest in centro-posterior positions. For condition IC, on the other hand, a strong centro-posterior positivity (CPS) begins at about 1000 msec. Moreover, it is preceded by a small posterior positivity which, however, does not meet the amplitude criterion of the CPS (see section 3.4). In addition, the small positivity is not apparent in the left part of the figure. However, a strong negative deflection (NEG) manifests from about 500 msec after the onset of the focused noun (right part of *Figure 20*). It is broadly distributed across the scalp.

The statistical analyses for the condition CC vs. IC (*Table 31* of Appendix A) reveal a first two-way interaction of the factors Condition x Hemisphere ($F(1,20)= 7.75$; $p \leq .05$) in the TW chosen for the compu tation of occurring negative deflections post sentence onset (1100-1600 msec). The analyses of the consecutive TW of 500 msec reveal an interaction of Condition x Hemisphere in the TW from 0-500 msec post matrix clause offset ($F(1,20)= 6.59$; $p \leq .0\,5$). A first main effect Condition ($F(1,20)= 13.76$; $p \leq .01$) in conjunction wi th a three-way-interaction of the factors Condition x Hemisphere x Region ($F(2,40)= 3.54$; $p \leq .05$) becomes apparent in the TW between 500-1000 msec. Its decomposition proves the distribution of the effect Condition to all ROIs, namely the left anterior ($F(1,20)= 5.24$; $p \leq .05$), the right anterior ($F(1,20)= 5.81$; $p \leq .05$), the left central ($F(1,20)= 8.76$; $p \leq .01$), the right central ($F(1,20)= 17.45$; $p \leq .01$), the left posterior ($F(1,20)= 10.47$; $p \leq .01$), and the right posterior one ($F(1,20)= 17.47$; $p \leq .01$). The con secutive TW from 1000-1500 msec displays a further three-way interaction ($F(2,40)= 3.85$; $p \leq .05$) yielding effects Condition in the right central ($F(1,20)= 7,87$; $p \leq .05$), and in the right posterior ROI ($F(1,20)= 5,24$; $p \leq .05$).

Within the last TW between 1500-2000 msec, a three-way interaction is present ($F(2,40)= 4.42$; $p \leq .05$). Its decomposition proves the distribution of an effect Condition to the left anterior ($F(1,20)= 7,08$; $p \leq .05$), the right central ($F(1,20)= 9,43$; $p \leq .01$), and the right posterior ROI ($F(1,20)= 8,03$; $p \leq .01$).

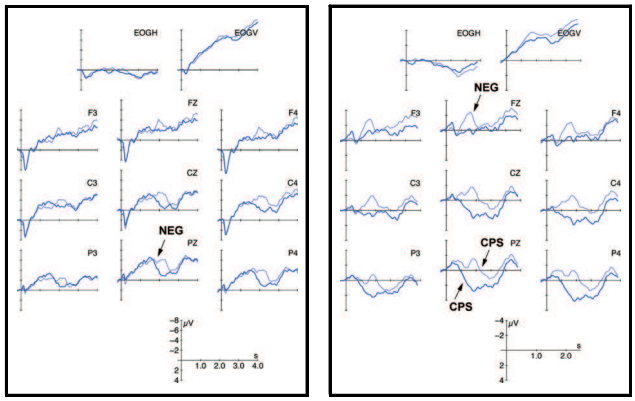

Figure 20: *ERPs (5 Hz low-pass filtered) from nine representative electrodes to the presentation of correction accents (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (CC), and the dotted line in non-matching context (IC).*

6.4.3 ERPs to i-topic accentuation

Figure 21 again displays the averaged ERP data of the participants when processing the third sentences of the dialogues. This time, the figure illustrates the brain responses to the prosodic realisations of i-topics in noun position which is followed by a correction accent in verb position. As a consequence, only the context preceding the accentuation patterns differs but not the actual intonation of the sentences.

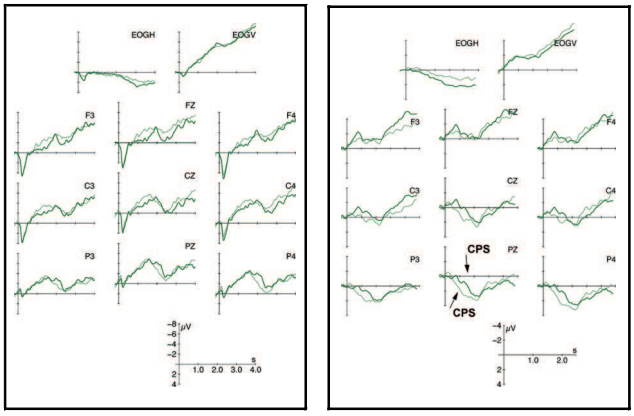

Figure 21: *ERPs (5 Hz low pass filtered) from nine representative electrodes to the presentation of i-topic accentuation (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (II), and the dotted line in non-matching context (CI).*

The solid lines depict the ERPs to the processing of i-topic (noun) + correction (verb) accentuation matching the preceding context (condition II). The dotted line, on the other hand, visualises the ERPs when the pragmatic information and the prosodic realisation are in conflict. In particular, the pragmatic information induces a correction here while the prosodic properties are those of an i-topic realised on the noun and a correction focus produced in verb position (condition CI). The left part of *Figure 21* illustrates the ERPs as averaged from the onsets of the critical accent bearing sentences of the dialogues. The right part, in contrast, depicts the same computation with an average onset just before the noun bearing the i-topic accent (i.e. ìAnnaî). The results of the statistical analyses can again be found in *Table 31* of Appendix A.

In the left part of *Figure 21*, a small negativity can be noted from 1000-1800 msec post sentence onset which is mostly anterior-centrally distributed. Statistical analyses for the comparison between condition II and CI (see *Table 31* of Appendix A) reveal

an interaction of the factors Condition x Region in the TW between 1100-1600 msec ($F(2,40)= 6.74$; $p \leq .01$). This TW had again been chosen for the examination of the negativity. However, the decomposition of the interaction does not uncover an effect Condition. The right part of *Figure 21* show centro-posterior positive deflections (CPS) starting at around 800 msec post matrix clause offset for condition II, and approx. 300 msec earlier for condition CI. Statistical analyses in consecutive TW of 500 msec reveal no effect Condition in the first TW (0-500 msec). The TW between 500-1000 msec displays a two-way interaction between the factors Condition x Region ($F(2,40)= 4.53$; $p \leq .05$) with its decompositio n proving an only marginal effect Condition in the posterior ROI ($F(1,20)= 3.95$; $p= .06$). The consecutive TW from 1000-1500 msec yields an interaction of the factors Condition x Hemisphere x Region ($F(2,40)= 6.09$; $p \leq .01$). The last TW of 1500- 2000 msec reveals a main effect Condition ($F(1,20)= 4.98$; $p \leq .05$), and a three-way interaction ($F(2,40)= 6.05$; $p \leq .01$). The decomposition of the interaction manifests an effect Condition in the left anterior ROI ($F(1,20)= 4.64$; $p \leq .05$).

6.5 Summary and discussion of Experiment III

Experiment III was designed to explore the prosodic realisation and the perception of i-topics as instances of contrastive *topic* information as opposed to corrections as instances of contrastive *focus* information.

The acoustic analyses (see section 6.3) show that the pragmatically differing information types give rise to deviating intonational realisations in German. The correction accent on the noun (“Anna”) in condition COR is transcribed as H*+L as in Experiment I (and Experiment II). In condition ITOP, on the other hand, the i-topic accent on the noun can be annotated as L*+H. Thus, it is attributed the same phonological structure as the novelty accent (condition NEW) from Experiment I. That means that the assumptions about the varying accent types on i-topics vs. corrected information in the nuclear position are corroborated (see section 6.2). Yet, the similarities in accentuation are only superficial. The phonetic divergence of the accents and their perceptual consequences will be discussed in further detail in chapter 8. However, an additional postnuclear accent in the position of the corrected

verb (“zu entlasten”) is conveyed by condition ITOP. In Experiment III, this particular accent can be transcribed as an L*+H accent, too.

The existence of rising accents in i-topic position is well documented. These accents (L*+H or L+H*, respectively) have then also been ascribed a function as the left edges of *hat contours* (Cohen & `t Hart, 1967) or *bridge contours* (Féry, 1993; Wunderlich, 1991). The right edges of these contours are generally falling accents (H+L). However, as apparent from *Figure 19*, the verb accent pattern (“zu entlasten”) is again a rising one (L*+H) so that no overall bridge contour is constituted (see also Braun, 2004 on this phenomenon). Hence, the hypothesis regarding the formation of a bridging F0 pattern between the i-topic on the noun and the correction focus on the verb has to be rejected.

The “missing” right pillar of the bridge contour can be caused by various factors. First, the overall sentence does not end after the verb but is continued by the conjunction clause. The presence of this clause was due to methodological restrictions of the ERP measurements as described in section 3.3.1. Nonetheless, the existence of this clause could have induced a *continuation rise* (Pierrehumbert & Hirschberg, 1990: 305) in the position of the verb. As a result, the speaker might not have lowered her pitch towards the right edge of the IPh or right edge of the proposed bridge contour, respectively.

Second, the verb position explicitly conveys a correction focus which is exhaustively contrastive. Most of the studies on bridge contours (e.g. Büring, 1997; Féry, 1993), however, employed novel focus information to follow the i-topic realisation. As discussed in detail in Experiment I and II, novelty focus is not exhaustively contrastive. Thus, the intonational reflections in these studies are not per se comparable to the present ones.

A possible third consideration on the rising verb accent refers to the salience of the accent of the also rising i-topic accent. The correction on the verb might have been produced by the speaker with a low onset (L*+H) to increase the salience of the preceding high F0 peak (L*+H) on the i-topic. By this, the speaker might have intended a clear separation of the i-topic accent and the high F0 peak on the correction focus in verb position.

However, singling out one alternative from these three explanatory options does not seem possible on the basis of the speech materials under investigation here.

The behavioural data in Experiment III show a strongly diverging picture between conditions. Participants were only well able to judge the appropriateness of correction accents in contexts which give rise to a correction focus (condition CC). The second condition with appropriate associations between context and accent properties (condition II), on the other hand, reveals a strong decrease in correct answers. There is no straight-forward explanation for listeners` behaviour in this i-topic conveying condition. Hence, as mentioned in the introduction to Experiment III, i-topics present a kind of the verbal pre-position in German which is only intonationally licensed. Hence, these materials might present an overall idiosyncratic case of expression. Moreover, no data as to the frequency of occurrence of i-topics in contrast to correction focus in spontaneous speech are yet available. All studies exploring the properties of i-topics have so far used introspective data and elicited utterances.

However, condition IC, which pragmatically implies an i-topic (noun) and a correction (verb), and is realised solely with a correction accent on the noun (“Anna”), displays similar results as the corresponding condition of Experiment I and II (condition NC). Thus, participants are likely to interchange correction and i-topic accents in equivalent sentence positions (i.e. the noun “Anna”). Furthermore, the missing correction accent in verb position (“zu entlasten”) does not result in a consistent rejection of condition IC. Thus, listeners do not seem to be able to exploit the accent cue on the verb.

This latter finding is, however, in congruence with the behaviour to condition NC of Experiment I and II. In condition NC, two novelty foci (noun and verb position) were ensued from the context, and intonated with a correction accent only on the noun. The correct answers (around 50 %) suggest that listeners in these experiments do not consider the missing verb accent as an interpretation cue either. The reason for the neglect of the verb accentuation might, as argued already in Experiment I and II, might be due to the merging of the prosodic focus domains of the verb and its argument (Selkirk, 1995).

However, participants` performance to condition CI is not comparable to the data from Experiment I and II (condition CN). Condition CI, with a context promoting correction focus and the intonational realisation of an i-topic in noun position (“Anna”) and a correction focus in the consecutive verb position (“zu entlasten”) are only identified as non-matching in one third of all trials. This behavioural pattern can be

interpreted into two directions, one considering the noun and one related to the verb position.

As to the noun-specific interpretation, it was argued in Experiment I and II that the accent with aligned stress and accent peaks on the noun ("Anna") cannot be interchanged with a sloppily articulated non-aligned accent (Gussenhoven, 2004). This accent-type based interpretation yet cannot account for the behavioural results in condition CI of the present experiment. However, the accents on the i-topic and on the corrected noun can both be considered as strongly contrastive. In particular, both exhaustively single out alternatives from a set of discourse propositions. Moreover, both are strongly marked by means of the extended F0 excursion (Rietveld & Gussenhoven, 1985). These parameters might, in turn, result in the opportunity to interchange them partially.

With respect to the verb accentuation, notably, the correction accent on the contextually given verb in condition CI did also not contribute to a consistent rejection of this condition. However, as apparent from condition IC of the present experiment as well as from condition NC of Experiment I and II, listeners can accommodate well to the accent pattern on the verb does not seem to be exploited by listeners for the prosodic appropriateness judgement overall.

On the other hand, why does the behaviour to the both non-matching conditions IC and CI differ then? If the assumptions regarding the opportunity to interchange stress-to-accent peak aligned accents are valid (Gussenhoven, 2004), the non-aligned i-topic accent should be more easily detected than the aligned correction accent on the noun. Consequently, participants must consider the verb accentuation in some way. As the superior results for condition IC suggest, listeners are more likely to neglect the "superfluous" verb accent in condition CI as opposed to the "missing" verb accent in condition IC.

With respect to the hypotheses on the behavioural results of Experiment III (see section 6.2), the responses confirm the assumption on accurate judgements of condition CC. However, all other hypotheses, namely regarding the accuracy rates in judging condition II, IC and CI have to be rejected.

The behavioural evidence for the possibility to interchange contrastive topic and focus accents is supported by the electrophysiological data. Neither the i-topic accentuation of a pragmatic correction focus (condition CI) nor the correction accent

in a context inducing an i-topic elicit negative deflections in or before the noun position (“Anna”). These negativities but accompanied the prosodic mismatch detection of novelty accents in contexts promoting correction focus (condition CN) in Experiment I and II.

However, a negative ERP is apparent for condition IC as opposed to condition CC in a later time window. This negativity is widely distributed over the scalp in the TW between 800-1200 msec following the offset of the matrix clause (see right part of *Figure 20*). The onset of the negativity is thus approximate to the onset of the verb position (“zu entlasten”, see *Figure 28* in Appendix B).

Accordingly, accent mismatch detection takes place online for condition IC but not for the accentuation of the noun (“Anna”). Instead, it is attributable to the perception of the correction accent (L*+H) in verb position. As listeners actually perceive the correction accentuation (COR in *Figure 19*) in condition IC, the following verb is deaccented. Since the i-topic context, however, induces the expectation of a focus position following the i-topic, a verb accent is expected. It is proposed that this mismatch between the expected and the actual accentuation on the verb causes a mismatch which is in turn reflected in a broadly distributed negativity.

However, it seems worth noting that the distribution of the negativity in Experiment III is by statistical means not greater than for the negative deflections in Experiment I and II. All considered TW for the negativities throughout the experiments reveal neither a hemispheric lateralisation effect nor a confinement in the anterior-posterior dimension.

The eliciting factors of the centro-posterior positive ERPs are, however, different ones. As in Experiment I and II, these positive peaks are apparent in relation to the perception of pragmatic focus positions. In detail, a centro-posterior positive deflection is evoked with a latency of approx. 300 msec to the noun (“Anna”) when the correction context implies a focus in the position of the noun (condition CC and CI). Based on the latency, morphology, and scalp distribution this positive deflection is interpreted as a focus-induced Closure Positive Shift (CPS; Hruska, 2004).

The CPS pattern in contexts promoting an i-topic on the noun (“Anna”) and a correction focus on the consecutive verb (“zu entlasten”) is, however, a different one.

For condition II (see right part of *Figure 21*), the CPS at posterior electrodes starts at approx. 700 msec post matrix clause offset. This time range is temporally close to

the onset of the verb in correction focus. For a closer examination of this temporal relation, *Figure 28* of Appendix B presents the ERPs for Experiment III as averaged from the onset of the verb ("zu entlasten"). By this, the right part of *Figure 28* in Appendix B displays that the CPS in condition II is elicited with a latency of approx. 300 msec to the verb onset. Thus, the CPS in condition II it can be attributed to the perception of the pragmatic correction focus on the verb.

In condition IC (*Figure 20*), on the other hand, the onset of the CPS is delayed to approx. 900 msec after the verb's onset ("zu entlasten"). However, condition IC pragmatically induced an i-topic in noun position and a correction in verb position. The left part of *Figure 28* in Appendix B again illustrates the temporal dimensions of the ERPs as averaged from the verb onset ("zu entlasten"). It is evident that the CPS in condition IC starts out approx. 200 msec later than in condition II. For this delay of the CPS at least a descriptive reason can be given. In particular, it is proposed that the high amplitude negative ERP for the missing verb accentuation (as discussed in the preceding paragraph) substantially postpones the onset of the CPS.

However, the detention does not last long enough to render the CPS attributable to the perception of the IPh boundary following the verb. As the onset of the CPS is still well before the onset of the last syllable of the verb (see *Figure 17*) the constituting properties of the IPh boundary could not have been encountered.

Thus, irrespective of the prolonged latency of the posterior positive shift due to the preceding strong negative waveform, the CPS is elicited to the perception of the verb in correction focus ("zu entlasten") in condition IC.

Hence, the CPS as a well-established marker for focus-induced information structural processing does not reflect the perception of contrastive information per se. Neither the pragmatic i-topic status (condition II and IC) nor their specific intonational markings (condition CI) result in the processing of this information as focused, and, in turn, to the elicitation of a CPS pattern. On the other hand, the processing of the pragmatic correction focus on the verb following the i-topic (condition II and IC) resembles that of focus positions (see Experiment I and II) in being reflected by a focus-induced CPS, respectively.

Moreover, the appropriate accentuation of the focus positions does not have substantial influences on the CPS. Apart from some latency jitter due to a negative prosodically driven mismatch ERP preceding the focus position, the CPS occurs with

similar morphology and scalp distributions to each pragmatic focus. However, as mentioned above, it does not reflect the perception of contrastive topics.

With respect to the hypotheses from section 6.2, the assumptions regarding the elicitation of the CPS by different kinds of contrastive information (focus vs. topic) can be confirmed. In contrast, the proposed negativity to inappropriate i-topic accents on actually corrected nouns (condition CI) was not apparent. However, the hypothesis that a missing correction accent in verb position (condition IC) does evoke a negative potential can be approved.

Taken together, the data from Experiment III present first non-introspective evidence regarding the information structural status of contrastive topics or, more specifically, i-topics. The results are most controversial for theoretical assumptions claiming that contrastive topics are part of the focus or the rheme of utterances as based on their intonational status (Steube, 2001) or their pragmatic function and intonational features (van Hoof, 2003).

However, theories that assume the topic or thematic status of i-topics by taking into consideration syntactic, pragmatic, and intonational means (Büring, 1997; Jacobs, 1996; Krifka, 1998) are supported by the current electrophysiological data.

7 Experiment IV: Correction focus vs. Givenness

Experiment IV was concerned with the intonational realisation of utterances incorporating correction foci vs. global givenness or [-focus] information, respectively. Furthermore, it was evaluated how the pragmatic focus structure and its prosodic realisation in German dialogue conversation is processed by the brain. With reference to the CPS as the validated ERP for the processing of pragmatic focus positions (see Experiment I-III), one question received special attention. In particular, the experiment served to explore brain reactions to dialogues in which a context does not promote any pragmatic focus positions.

Given information refers to information that is shared between two interlocutors. According to Chafe (1974), speakers produce *given* information in a way that enables listeners to distinguish it from *new* information in discourse. Defining the notion of givenness, Chafe does not imply that all information uttered at some stage in a discourse can be considered "given information". For information to be currently given, it must be present in the listener's awareness, hence it has to be just mentioned. In the view of Halliday (1967), however, given information must be "anaphorically recoverable" from a current discourse. Thus, views differ as to whether information has to be just mentioned to be *given* or whether it is sufficient that information is accessible from the discourse to be acceptable as *given*. However, complete utterances are very seldom repeated within the process of communication. Such utterances actually violate the "Principles of Quality" as stated by Grice (1975). In general, pronominalisation is employed when speakers refer to events or persons that have already been mentioned in the discourse and are "recoverable" (e.g. McKoon & Ratcliff, 1980). By pronominalisation, a deictic or anaphoric "chain" is constituted between the recurring sentence element and its former instantiation. On the other hand, complete utterances can be repeated when a listener has failed to understand the content of the utterance or, e. g. when the listener wants to express uncertainty about the communicated proposition.

With respect to the accentuation of given information, it is often noted that given or [-focus] sentence constituents tend to be produced with a lower fundamental frequency. Hence, given sentence constituents as part of the *background* information are often deaccented (Ladd, 1996: 293; Terken & Hirschberg, 1994).

However, when complete utterances are contextually given, theoretical problems arise from the notion of unaccented phrases. First, it is unclear whether these [-focus] utterances are intonationally treated as somehow following the accent alignment rules of context-free utterances (Cinque, 1993). Second, when unaccented phrases are taking strictly as `conveying no pitch accent`, these sentences cannot form Phonological or Intonational Phrases as these phrases must contain at least one pitch accent by definition (Selkirk, 1984). Hobbs` account (1990: 314) of intonational meaning offers a different opinion to the accentuation of given information. Hobbs proposes (with reference to P&H, 1990) the annotation of information that is *not new* (in his account thus *given* or *false*) with a low pitch accent (L*). Convincing evidence exists that the prosodic realisation of *given* and *new* information actually differs. Shields and Balota (1991) reported shorter durations and lower F0 peak amplitudes for repeated words than for new ones within the same sentence embeddings. Moreover, Koopmans- van Beinum & van Bergem (1989) reported spectral effects and a lowered F0 peak but no durational consequences for contextually given sentence constituents. Gussenhoven (1983b) reports in an experiment on English that [-focus] sentences often bear an accent on the last word. Furthermore, he confirmed that [-focus] givenness intonation is judged less prominent than a [+focus] novelty accentuation a perception experiment. Furthermore, Bock & Mazella (1983) found a reaction time advantage in a perception study on English when given information was deaccented than when it was accented (for examples see chapter 3.2). In line with the study of Gussenhoven, Nooteboom & Kruyt (1987) conducted a perception experiment in Dutch. They presented listeners with question-answer pairs. The results showed that participants judged sentences incorporating given information as more appropriate when the accentuation pattern matched the given information. On the other hand, given information with the intonation of novelty focus was judged as less appropriate. Another experiment by Terken & Nooteboom (1987) which employed picture descriptions described similar results. It was found that listeners are better at verifying given information when the givenness was presented in an unaccented way.

Experiment IV thus served to examine the prosodic properties of non-focal, given, information as opposed to correction focus. Moreover, the perception of given vs. correction information is to be explored when presented with matching vs. non-matching prosodic realisations of these information types.

7.1 Materials

Table 17 illustrates the composition of the dialogue conditions in Experiment IV. Each dialogue consists of three sentences.

In the critical third sentence with correction accentuation (condition COR) the noun “Anna” is contrasted with the noun “Frauke” from the preceding question. Hereby, a correction focus is established only on “Anna” as all other constituents are contextually given.

The condition with the supposed intonation of givenness (condition GIV), on the other hand, does not imply a focus in any of the considered sentence positions. The noun “Anna” and the verb ”zu entlasten” both already appear in the context question preceding the critical third sentence of the dialogues. Thus, all sentence constituents are [-focus] or given information, respectively.

However, both conditions (COR and GIV) additionally constitute a novelty focus in the conjunction clause. The complete materials for Experiment IV are to be found in Appendix C.

The comparison of the conditions COR and GIV allows for the evaluation of the properties of corrective accentuation as opposed to the accentuation of givenness in German.

Second, information structure bound processing can be investigated under conditions (*Table 17*) where the pragmatic and prosodic properties of utterances equally subserve the interpretation of a discourse situation vs. when pragmatics and prosody are in conflict. For the purpose of the actual perception experiment, two conditions with matching pragmatic and prosodic requirements (CC and GG) were presented to participants. Furthermore, two conditions with non-matching pragmatic and prosodic information structures (CG and GC) were composed by combining the two context sentences of one condition (GIV or COR, respectively) with the particular accentuation bearing third sentence of the opposite condition (COR or GIV).

All of these matching and non-matching combinations between the contextually construed pragmatic information structure and the prosodic realisation (accentuation) are illustrated in *Table 18*.

CORRECTION FOCUS (COR)	A: Am Samstag hat Peter mir etwas versprochen. *On Saturday Peter promised me something.* B: Hat er Dir versprochen, Frauke zu entlasten? *Did he promise Frauke to support?* A: **Er hat mir versprochen, [Anna]$_{COR}$ zu entlasten** **[und die Küche zu putzen.]$_{NEW}$** *He promised Anna to support and the kitchen to clean.*
GIVEN INFORMATON (GIV)	A: Am Samstag hat Peter mir etwas versprochen. *On Saturday Peter promised me something.* B: Hat er Dir versprochen, Anna zu entlasten? *Did he promise Anna to support?* A: **Er hat mir versprochen, Anna zu entlasten** **[und die Küche zu putzen.]$_{NEW}$** *He promised Anna to support and the kitchen to clean.*

Table 17: *Examples of the materials used in Experiment IV (with literal translations). Sentences in bold type entered the acoustic analyses.*

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction (COR)	Correction (COR) in the critical sentence (condition CC)	* Givenness (GIV) in the critical sentence (condition CG)
Givenness (GIV)	Givenness (GIV) in the critical sentence (condition GG)	* Correction (COR) in the critical sentence (condition GC)

Table 18: *Formation and annotation of the conditions in Experiment IV. The star (*) signals the inappropriateness of a pragmatic and a prosodic information structural requirements.*

The condition annotation in *Table 18* as well as for the behavioural and ERP data is arranged as follows: The first letter of the condition name denotes the pragmatic information structure (“C” for correction focus, and “G” for givenness). A second letter then designates the actual prosodic realisation (“C” for correction accentuation, and “G” for the intonation of givenness). Thus, when the first and the second letter coincide, the association of the pragmatic and the prosodic structure do match. When the letters disagree, on the other hand, the pragmatic and the prosodic information properties diverge.

For the analyses of the ERP data, always the conditions with identical intonational realisations but diverging preceding context information will be compared. By doing so, confounded effects of the pragmatic and prosodic information structure are avoided.

7.2 Questions and Hypotheses

Prosodic realisation

With respect to the prosodic realisation, it should be noted that for Experiment IV the same speaker was employed as for Experiment II.

It is proposed that the differing information types of correction focus and givenness lead to substantial intonational consequences. With respect to the accentuation of corrections (condition COR), it is assumed that the particular speaker for Experiment IV employs an H*+L accent to produce the focused noun (“Anna”). Moreover, the speaker is assumed to utilise postfocal deaccentuation as exhibited by the same speaker in Experiment II. The intonation of overall givenness (condition GIV), however, is hypothesised to display a deaccented pattern throughout the utterance. This pattern is expected to incorporate the contextually given noun (“Anna”) as well. In accordance with the assumptions of Hobbs (1990), the noun is hypothesised to comprise a low accent (L*). However, it is unclear whether this nuclear accent position can be realised as a monotonal one at all as nuclear accents are supposed to be obligatorily bitonal (Féry, 1993).

Behavioural results

Participants are expected to be well able to identify the experimental conditions with matching pragmatic and prosodic information structures. Hence, the condition displaying a pragmatic correction focus in noun position (“Anna”) with the appropriate realisation of a correction focus on the noun (condition CC) is supposed to yield high percentages of correct answers. In addition, the condition with matching associations of contextually given information and the intonation of givenness (condition GG) is expected to result in a high quantity of correct answers, too.

As derivable from the results of the previous experiments, it is furthermore hypothesised that the participants are well able to detect a low accent (L*) when the

context actually determines a correction (H*+L) as in condition CG. On the other hand, correction accents on contextually given information (condition GC) are expected to be judged by the participants in an inconsistent way. As a result, less correct answers should be evident.

ERP data

Based on the ERP data obtained in Experiment I-III, it is hypothesised that the Closure Positive Shift (CPS) accompanies the perception of pragmatically determined focus positions. Thus, CPS deflections should be elicited to the perception of the corrected noun (“Anna”) in the conditions CC and CG. Moreover, the CPS is expected to be independent from the accentuation of the pragmatic foci as should become apparent from the processing of the inappropriate condition CG.

However, the electrophysiological reactions which have to be expected to the processing of conditions incorporating exclusively given information are less clear-cut. First of all, the conditions implying givenness (condition GG and GC) do not give rise to any focus position. Thus, no contextually driven CPS to a focus position can be expected. Yet, as the data of Hruska (2004a) indicate, the CPS can also be a marker for the perception of accent positions. Hence, the accents in noun position (“Anna”) might induce a CPS to this position when it bears a corrective accentuation.

Moreover, it can be expected that the accent-driven CPS then appears with the same latency than the context-driven CPS (Hruska, 2004). As a consequence, no statistical differences should be obtained by comparing condition CC vs. GC, and GG vs. CG. However, when the actual contextual environment is of any significance for the elicitation of the CPS, the latency of the CPS should display differences. In particular, it is hypothesised that the lack of pragmatic foci (in condition GG and GC) gives rise to an intonation-bound elicitation of the CPS as reported by studies employing context-free utterances (Steinhauer et al., 1999; Pannekamp et al., 2005). Hence, it is expected that in condition GG and GC the processing of the IPh boundary (Selkirk, 1984) at the right edge of the matrix clause (“Er hat mir versprochen”) evokes a CPS deflection. Since this IPh boundary precedes the noun position constantly under consideration in the experiments (i.e. “Anna”), it is hypothesised that the CPS to the conditions comprising given information (conditions GG and GC) also precedes the CPS to the conditions containing a correction focus in noun position (condition CC and CG).

In addition to the context-driven positive deflections in the ERP data, a centro-posterior negativity is expected. In detail, the negativity is assumed to accompany the perception of the monotonal low pitch accent in contexts where the realisation of a correction focus accent is expected (condition CG).

7.3 Acoustic and phonological analyses

7.3.1 Segment and pause durations

Figure 22 and *Table 23* (Appendix A) display the segment and pause durations within the particular accentuation bearing sentences of Experiment IV, and statistical analyses of differences between the prosodic realisations of corrections (COR) vs. givenness (GIV).

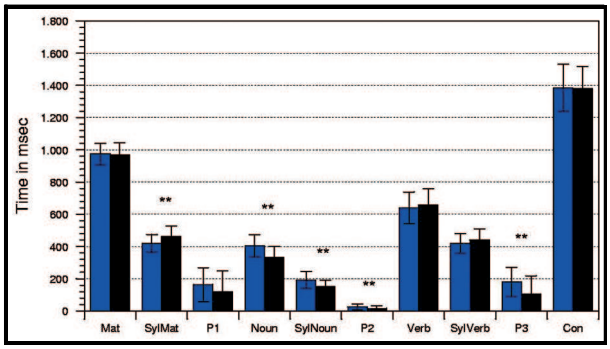

Figure 22: *Segment and pause durations in the particular accentuation bearing third sentences of Experiment IV (*p .05; **p .01). The blue bars de pict the results for corrections (COR), and the black bars for givenness (GIV).*

As apparent from *Table 23*, initial differences between condition COR and GIV (see *Figure 22*) are notable in the position of the last syllable of the matrix clause (SylMat). Thereby, the syllable is longer in condition GIV than in condition COR. In the further course of the materials, condition COR exhibits longer durations in the position of the noun and its last syllable (Noun, SylNoun), and the following pause (P2). No length differences are displayed in the consecutive verb position (Verb). However, the pause (P 3) preceding the conjunction clause, shows a significantly longer duration for condition COR again.

Hence, the properties of corrections vs. givenness are reflected by durational means in noun position.

7.3.2 Analysis und phonological description of F0

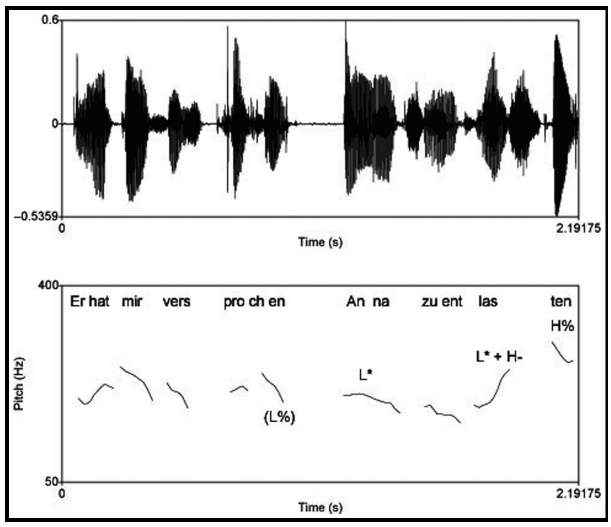

Figure 23: *Oscillogram and F0 course of one representative sentence from condition GIV for illustration.*

For reasons of visualisation, *Figure 23* displays the F0 course within a representative single sentence with givenness accentuation (GIV) first.

Figure 24 and *Table 27* (Appendix A), on the other hand, exhibit the averaged F0 values of the forty-four accent bearing third sentences per condition (correction of the noun = COR; given accentuation on all constituents = GIV). All displayed F0 values and their corresponding time points in *Figure 24* are derived from computations described in section 3.3.2. The phonological annotation follows the framework introduced in the end of section 2.1.

In general, it is again worth noting that the speaker of these materials (similar to Experiment II) shows a far more compressed F0 range than the speaker for the Experiments I and III.

The intonation contours (*Figure 24*) exhibit a higher early accent within the matrix clause (“Er hat mir versprochen”) of condition COR as opposed to condition GIV. Furthermore, high tones are apparent on the last syllable of the matrix clause for both conditions. In accordance with the duration values, these high tones are interpreted as high boundary tones (H%) indicating an IPh boundary for both conditions.

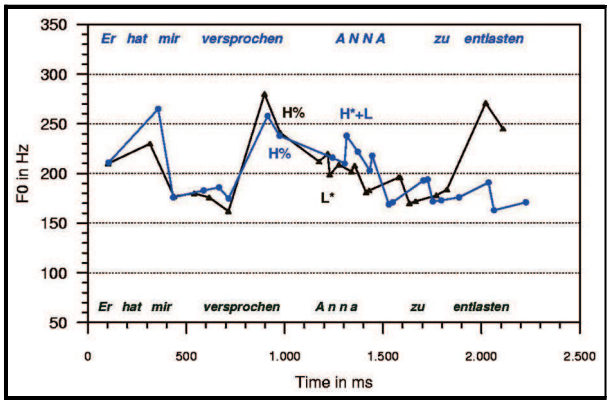

Figure 24: *F0 pattern in the third sentences (without conjunction clause) of Experiment IV. Capitals signal focus positions. The blue line depicts the F0 course for correction focus on the noun (COR) while the black line indicates the F0 course for overall given information (GIV).*

The height of the F0 peak in the consecutive noun position ("Anna") differs only by 20 Hz (≈ 1.3 semitones of the speaker's range) between conditions. However, the F0 excursion in this position is much more pronounced for condition COR than for condition GIV (80 Hz or 5.3 semitones for condition COR vs. 40 Hz or 2.7 semitones for condition GIV). Moreover, the salience of the correction accent is further enhanced by postfocal deaccentuation. Condition GIV, on the other hand, exhibits a high tone in the verb position following the noun.

The phonological transcription for the correction accent in noun position ("Anna") is chosen to be a bitonal H*+L pattern on the basis of the overall F0 excursion. Furthermore, a clear high F0 peak is associated with the primary stressed syllable of the noun which is followed by a steep fall on the second syllable. As for condition GIV, the accent is annotated as a monotonal L* due to the compressed tone movements between the syllables of the noun.

The further F0 course of condition COR is transcribed as L- L% due to the deaccented pattern on the verb ("zu entlasten") and the low realisation of the consecutive IPh boundary. Condition GIV, on the other hand, is annotated as an L-H% pattern due to the low tone realisation on the verb ("zu entlasten") which descends into a high boundary tone on the last syllable of the verb.

All F0 values are averaged per condition and displayed in *Table 27*.

7.4 Experimental data

Twenty-two volunteers took part in the ERP experiment (11 female). Their mean age was 24.7 years (sd 3.21). All were right-handed (Oldfield, 1971), and without any known neurological or hearing disorders. None of them had taken part in one of the previous experiments of the series.

During the EEG recordings, they were auditorily presented with 176 dialogue trials (44 per condition). After each trial, they had to judge whether the intonation contour of the last sentence was appropriate with respect to the preceding context sentences (see section 3.3.3 for details).

7.4.1 Behavioural results

Context determines	***Matching accentuation***	**** Non-matching accentuation***
Correction	Correction (CC) = 94.9 %	* Givenness (CG) = 89.7 %
Givenness	Givenness (GG) = 70.9 %	* Correction (GC) = 54.0 %

Table 19: *Correct answers per condition in Experiment IV. The star (*) signals the inappropriateness of a pragmatic and a prosodic information structure.*

As displayed in *Table 19*, the performance of the participants was above 94 % in the condition with a pragmatic correction focus and the matching accentuation of corrections (condition CC). Furthermore, the inappropriateness of the condition with a pragmatic correction focus presented with the accentuation of givenness (condition CG) was easy to identify for the participants (above 89 %).

However, the associations of contexts assigning givenness with the assumed matching prosodic pattern (condition GG) only yielded approx. 71 % correct responses. Accuracy rates are further decreased when correction accents are embedded in contexts implying overall givenness (condition GC).

7.4.2 ERPs to correction accentuation

Figure 25 displays the averaged ERP data of the twenty-two participants in Experiment IV when processing the third sentences of the dialogues. In particular, the figure illustrates the brain responses to correction accentuation. As a

consequence, only the context preceding the accentuation patterns differs but not the actual intonation of the sentences.

The solid lines depict the ERPs to the processing of correction accentuation matching the preceding context (condition CC). The dotted line, on the other hand, visualises the ERPs when the pragmatic information and the prosodic realisation are in conflict. In detail, the context promotes informational givenness in all considered sentence positions while the accentuation is that of correction focus (condition GC). The left part of *Figure 25* illustrates the ERPs as averaged from the onsets of the correction accent bearing sentences. The right part, in contrast, depicts the same computation with an average onset just before the focused noun (i.e. “Anna”) at the end of the matrix clause.

The results of the statistical analyses can also be found in Table 32 of Appendix A.

Descriptively, the right part of *Figure 25* displays a sustained positive ERP deflection in central-posterior sites. Apparently, this waveform starts about 200 msec earlier for condition GC than for condition CC.

Statistical analyses for the comparison of condition CC vs. GC reveal significant effects in successive TWs of 500 msec starting at the offset of the matrix clause (see *Table 32*). For the TW between 0-500 msec an interaction of the factors Condition x Region ($F(2,42)= 15.35$; $p\leq.01$) is apparent whose deco mposition manifests an effect Condition in the posterior ROI ($F(1,21)= 9,91$; $p\leq.01$). The TW from 500-1000 msec yields an interaction of the factors Condition x Hemisphere x Region ($F(2,42)= 7.30$; $p\leq.01$). The consecutive TW from 100 0-1500 msec reveals interactions between Condition x Hemisphere x Region ($F(2,42)= 11.24$; $p\leq.01$) and the factors Condition x Hemisphere ($F(1,21)= 6.56$; $p\leq .05$).Considering the last TW between 1500-2000 msec, a three-way interaction is displayed ($F(2,42)= 4.42$; $p\leq.05$). Its decomposition manifests effects Condition i n the left anterior ($F(1,21)= 7,08$; $p\leq.05$), the right central ($F(1,21)= 6,75$; $p\leq.05$), and the right posterior ROI ($F(1,21)= 5,62$; $p\leq.05$).

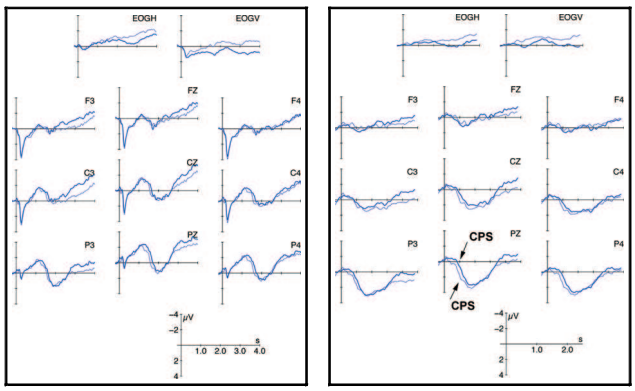

Figure 25: *ERPs (5 Hz low-pass filtered) from nine representative electrodes to the presentation of correction accents (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (CC), and the dotted line in non-matching context (GC).*

7.4.3 ERPs to givenness

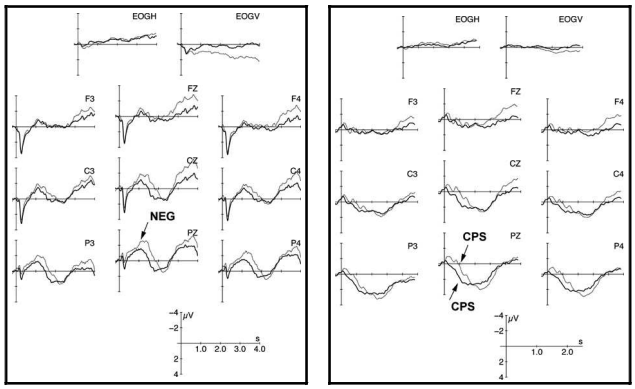

Figure 26: *ERPs (5 Hz low pass filtered) from nine representative electrodes to the presentation of givenness accentuation (left: from sentence onset, right: from the offset of the matrix clause). The solid line illustrates the brain responses in matching context (GG), and the dotted line in non-matching context (CG).*

Figure 26 again displays the averaged ERP data of the participants when processing the third sentences of the dialogues. This time, the figure illustrates the brain responses to the prosodic realisations of givenness. As a consequence, only the context preceding the accentuation patterns differs but not the actual intonation of the sentences.

The solid lines depict the ERPs to the processing of [-focus] accentuation matching the preceding context (condition GG). The dotted line, on the other hand, visualises the ERPs when the pragmatic information and the prosodic realisation are in conflict. In particular, the context releases a correction focus on the noun ("Anna") while the prosodic properties are those of givenness (condition CG). The left part of *Figure 26* illustrates the ERPs as averaged from the onsets of the sentences with the accentuation of givenness. The right part, in contrast, illustrates the same computation with an average onset just before the noun position (i.e. "Anna") at the end of the matrix clause. The results of the statistical analyses can also be found in *Table 32* of Appendix A.

The left part of *Figure 26* displays a centro-posterior negativity for condition CG as opposed to GG. This negativity starts at approx. 1000 msec post sentence onset. The right part of this figure depicts a centro-posterior positivity which starts at the offset of the matrix clause in condition GG, and with a delay of approx. 300 msec in condition CG.

For the analysis of the negative deflection, the TW from 1100-1600 msec post sentence onset was chosen. Its statistical analysis (see Table 32) results in an interaction of the factors Condition x Region ($F(2,42)= 9.90$; $p\leq.01$) whose decomposition manifests an effect Condition in the posterior ROI ($F(1,21)= 14,56$; $p\leq.01$).

A first main effect Condition within the TWs of 500 msec post matrix offset is exhibited in the TW between 0-500 msec ($F(1,21)= 9.35$; $p\leq.01$). The additional interaction Condition x Region ($F(2,42)= 5.54$; $p\leq.0\ 5$) proves the distribution of an effect Condition in the central ($F(1,21)= 7,85$; $p\leq.0\ 5$), and in the posterior ROI ($F(1,21)= 17,10$; $p\leq.01$). The TW from 1000-1500 msec yields an interaction of the factors Condition x Hemisphere x Region ($F(2,42)= 5.03$; $p\leq.05$), and the factors Condition x Region ($F(2,42)= 6.65$; $p\leq.05$). The last computed TW between 1500-2000 msec displays an interaction of the factors Condition x Region as well ($F(2,42)= 8.23$; $p\leq.01$). Its decomposition manifests an effect Condition in the anterior ROI ($F(1,21)= 4,39$; $p\leq.05$).

7.5 Summary and discussion of Experiment IV

Experiment IV was designed to explore the prosodic realisation and perception of correction focus as opposed to information that is contextually given or [-focus].

Acoustic analyses (see section 7.3) reveal that the pragmatically different discourse contexts evoke differing prosodic realisations in German. The accent on the corrected noun (“Anna”; condition COR) was interpreted as a bitonal pattern (H*+L). The accent on contextually given information in noun position (condition GIV) is proposed to be monotonal (L*) due to the lack of a decisive tone movement in this position.

Furthermore, for condition GIV greater deaccentuation is employed than for condition COR in the position of the matrix clause (“Er hat mir versprochen”). On the other hand, only condition COR displays complete deaccentuation in the position of the verb (“zu entlasten”) resulting in a low IPh boundary on the verb (L%). In condition GIV, the F0 is reset before the IPh boundary, and a high boundary tone (H%) is realised on the verb’s last syllable.

With respect to the hypotheses stated in section 7.2, intonational differences between focus accentuation and the intonation of givenness could be proven. While the focus accent on corrections was realised with a falling H*+L accent, givenness displays a monotonal L* accent. Hence, all assumptions on the accentuation patterns are confirmed.

In congruence with the hypotheses on the behavioural results, participants were well able to recognise when pragmatic correction foci on the noun (“Anna”) were presented with an appropriate accentuation (condition CC). However, the expectation on the behaviour to condition GG was not fulfilled. In this condition, contextually given information was combined with the actually matching accentuation of givenness. The relatively low amount of correct answers to condition GG can yet be interpreted. As apparent from the materials section 7.1, the content of the context question and the content of the accentuation-bearing third sentences largely overlap (apart from the conjunction clause). As mentioned in the introduction to Experiment IV, the complete repetition of utterances presents a very rare communicative instance. Fully repeated utterances actually violate Gricean communication maxims,

namely the “Principle of Quality” (Grice, 1975). Thus, it is proposed that listeners do not have difficulties in judging condition GG for intonational reasons but due to the overall implausibility of completely repeated statements. It might be the case that only the novel information in the conjunction clause (“und die Küche zu putzen”) prevents listeners from completely rejecting condition GG.

With respect to the responses to the inappropriate combinations of pragmatic information and accentuation, the hypotheses, however, can be confirmed again. In strong accordance with the data from Experiment I and II, condition CG exhibits a high amount of correct answers. This condition induces a pragmatic correction focus in noun position (“Anna”) which is presented with the accentuation of givenness. Thus, although the content of the critical sentence resembles the content of the context question here (as in condition GG), participants seem to base their judgements on the missing correction focus accent (H*+L).

Moreover, condition GC which pragmatically implies given information which is realised with a correction accent on the noun (“Anna”) is judged inconsistently by the listeners. These results are once more in congruence with the data on condition NC of Experiment I and II. Thus, even in contextual environments ascertaining givenness, correction accents are ambiguously interpretable or acceptable, respectively.

These behavioural findings are generally in corroboration to the perception results of, e.g. Nooteboom & Kruyt (1987). Nooteboom & Kruyt showed that a [-focus] accentuation on pragmatically [+focus] sentence constituents (as in condition CG) is not acceptable for listeners. On the contrary, a [+focus] accentuation on pragmatically [-focus] sentence constituents (as in condition GC) is not consistently rated as incorrect, hence can be accommodated to (for an overview of similar findings see Cutler, Dahan & van Donselaar, 1997).

The behavioural results for the conditions with pragmatically and prosodically non-matching associations (conditions CG and GC) are supported by the ERP data as well.

The centro-posterior negativity (NEG) which has been proposed to reflect an accent mismatch detection is solely apparent for the condition with a somehow “underspecified” accent (condition CG), thus when a bitonal H*+L correction accent is expected but a monotonal L* is encountered. On the contrary, condition GC does not

evoke such a mismatch response. Hence, the somehow "overspecified" correction accentuation (H*+L) can be accommodated to although the context determines the intonation of givenness (L*). These findings are again in strong accordance with the data of Experiment I and II (condition NC).

Hruska (2004: 84ff.) presented similar ERP data for the perception of accents on nouns that are not pragmatically focused (interpreted as "superfluous" accents). Moreover, she reported a prosodic mismatch correlate for pragmatically focused nouns that are not accentually marked. Here, a biphasic N400-P600 pattern appeared on these "missing" accents. She interpreted this biphasic response in terms of the "… *aggravated integration of new information caused by the missing prosodic marking*…" followed by a "… *reanalysis of the information structure…*" (p. 88; literal translation).

This interpretation will be discussed later in the current section as the positive deflections in the ERP data have to be presented beforehand.

In addition to the negative ERP to condition CN, all conditions display one centro-posterior positive deflection. With respect to the morphology and scalp distribution the positivity is interpreted as Closure Positive Shift (CPS). However, due to the latency differences between the conditions CC and CG vs. GG and GC (compare *Figure 25* with *Figure 26*) the eliciting factors of the CPS seem to diverge. Notably, the latencies differ as a function of the discourse context but not as a function of the intonational realisation. In particular, the CPS response to the conditions GG and GC appears approx. 200-300 msec earlier than the deflection to the conditions CC and CG. This temporal difference is statistically manifested by effects Condition in the TW from 0-500 msec which are mainly distributed to central and posterior ROIs (see Table 32 of Appendix A).

Figure 29 (see Appendix B) provides a further illustration of this latency effect. For this particular plot, the ERPs have been averaged to the onset of the last syllables of the matrix clause ("Er hat mir versprochen"). In contrast to all ERP figures described so far, this figure displays the responses to the givenness *contexts* (left panel: condition GG and GC) vs. the deflections to correction *contexts* (right panel: condition CC and CG). In detail, it becomes apparent that the CPS pattern to the givenness contexts is as congruent as the deflections to the correction contexts. Moreover, the latency of the CPS to the givenness contexts is then congruent with the latency of the CPS for correction foci (right panels of *Figure 25* and *Figure 26*).

Based on the differing latencies of the CPS to givenness contexts (condition GG and GC) as opposed to the correction contexts (condition CC and CG) it is proposed that the eliciting factors of the positive deflection differ as a function of the contextual environments. While the correction context resembles the findings of a focus-induced CPS from the previous experiments, processing mechanisms for contextually embedded utterances with no focused information differ. As evident from *Figure 29* (see Appendix B), the evoking cue of the CPS is then located in the last syllable of the matrix clause. The acoustic analyses (see section 7.3) have shown that this syllable comprises an IPh boundary.

Moreover, it variously been reported that the CPS is an electrophysiological marker as to the perception of IPh boundaries in context-free utterances (Steinhauer et al, 1999; Pannekamp 2004; Pannekamp et al., 2005). In accordance, it is proposed that the CPS in givenness contexts is also elicited to the processing of IPh boundaries as the speech signals do not comprise any focus positions for their structuring and interpretation.

However, this interpretation raises a major problem. Participants can only determine the informational givenness of the noun (“Anna”) by comparing the particular noun to the identical noun in the preceding context question. However, the proposal above states that the CPS is already elicited before the actual noun position is encountered. Hence, listeners must exploit cues preceding the noun position “Anna” to induce the switch in the processing mechanism. As reported in the acoustic analyses of Experiment IV (see also *Figure 24*), the prosodic pattern of the matrix clause (“Er hat mir versprochen”) differs between the conditions COR and GIV. In particular, the deaccentuation in condition COR is not as strong as in condition GIV. In detail, the F0 peak difference between the conditions is approx. 50 Hz (≈ 3.3 semitones). Furthermore, the pitch excursion size within the matrix clause is around 60 Hz (≈ 4.8 semitones) in condition COR as opposed to 20 Hz (≈ 1.6 semitones) in condition GIV. According to perception results of Rietveld & Gussenhoven (1985), and of Ladd, Verhoeven & Jacobs (1994) these intonational differences would be sufficient for listeners to disambiguate the accent structure of utterances.

However, the shift in processing is bound to a particular context and not relying on the actual intonation as it proves latency differences for the CPS between the conditions GG and GC as opposed to the conditions CC and CG. Thus, the cue for

the elicitation of the CPS in givenness contexts by means of the IPh boundary has to be considered further.

Under a post-hoc hypothesis, the intonation properties of the context questions preceding the critical third sentences were examined closer. The evolved results are displayed in *Table 28* and *Figure 30* in Appendix B. The figure clearly indicates diverging intonation patterns between the conditions COR and GIV. The context question preceding givenness (black line) exhibits a rising pattern (L*+H) starting in noun position. This particular F0 course is quite common in the German yes-no question intonation (Ladd, 1996: 133ff). The context question (blue line) inducing the correction of the noun ("Anna"), on the other hand, displays a high accent peak on the noun to be contrasted which is immediately followed by a steep fall (H*+L). Similar accent shapes have been shown throughout this thesis to accompany correction information as one instance of contrastive focus (see also Uhmann, 1991; Féry, 1993). In addition, the questions promoting givenness display an F0 onset which is 30 Hz (1.5 semitones of the speaker's range) higher than in the contrasting question, and a non-decisive tone movement. Exemplary ERP responses to the context questions [1] (*Figure 31*) furthermore show that the processing of the context questions inducing givenness in the consecutive answer leads to an amplitude difference in an early positivity (POS) which peaks approx. 250 msec post question onset. This component will not be extensively discussed here. In brief, it is interpreted as a P200 due to its latency and its scalp distribution. This ERP belongs to the rather exogenous ERP components influenced by e.g. the acoustic characteristics of an input signal (Rugg & Coles, 1995). Thus, an acoustic difference between the questions ascertaining correction focus vs. givenness is processed very early and online by listeners. As apparent from *Figure 31*, the amplitude of the P200 (POS) is always more pronounced for questions which render following information `given` than for questions establishing a contrast (dotted line in the left panel; solid line in the right panel of *Figure 31*). Hence, listeners already seem to be enabled by the intonation properties of the context question to employ differing processing mechanisms for contexts prompting focused information as opposed to contexts that do not determine focus information. This is in turn reflected by the appearance of the CPS to the noun position ("Anna") when a focus is ensued from the context (conditions CC and CG) vs. the exploitation of IPh boundary cues (H%) for the

[1] Solely treated with automatic rejections of eye movement artefacts; the number of trials per condition per participants varies between 3-40 as they had been allowed to blink during question presentation.

structuring of utterances when no focused information is determined (conditions GG and GC).

Perceptual evidence as to the role of contextual information to predict accent positions has been presented, inter alia, by Cutler (1976). She could convincingly show that sentence-initial intonation plays a decisive role for the computation of the global prosodic structure or, more specific, the accent distribution of an utterance.

Thus, in accordance with the negative ERP obtained in Experiment IV, the interpretation of Hruska (2004) and Hruska et al. (2004) for the condition with missing focus accents (condition CG here) in terms of a N400/ P600 pattern is not supported. First, there is no indication of a P600 in Experiment IV. All four experimental conditions (matching and non-matching) display CPS deflections alike which do only vary in latency due to the differing contextual environments. Second, the centro-posterior negativity (NEG) to condition CG already starts at the offset of the matrix clause (see right part of *Figure 26*), and is not apparent in the attested time range of the N400 (200-600 ms) anymore. Hence, the prosodic mismatch detection for condition CG starts before the actual accent position ("Anna") can be encountered. In particular, it seems to be triggered by intonational properties of the speech signal preceding the noun (i.e. the specific question intonation and the sentence-initial prosodic pattern). With respect to the hypotheses stated in section 7.2, it can thus be confirmed that the CPS displays a focus-bound elicitation in discourses determining correction foci. Moreover, the hypothesis that the CPS is evoked by the perception of IPh boundaries in the absence of information foci could be attested.

To sum up, the data of Experiment IV present a link as to the evoking conditions of the CPS in context-free sentences as opposed to context-embedded utterances. It could be shown that the CPS reflects the perception of focus information in context-embedded utterances. However, when context-embedded utterances or dialogues, respectively, do not comprise focus information listeners employ different processing strategies to structure and interpret the language input. In particular, they take into account prosodic devices, namely major prosodic boundaries. By doing so, listeners then display CPS responses in temporal coupling with Intonational Phrase boundaries.

However, further research on this particular aspect is inevitable (i.e. with less prosodic cues within context questions) to determine whether this finding can be generalised to discourse interpretation.

8 General discussion and future research perspectives

8.1 Summary of the experimental data

The work at hand was concerned with spoken language processing in context, the so-called information structural processing (Halliday, 1967). The production of information structure was considered by examining the accentuation of information centres (foci and contrastive topics) in utterances as opposed to contextually given information. Based on these observations, the perceptual consequences of contextually established information centres and the reliance of perception mechanisms on the intonational realisation of these information centres were investigated.

For the examination of real-time effects in the processing of contextually embedded utterances the methodology of event-related potentials (ERP) was employed. In particular, a validated event-related component to the structuring and interpretation of spoken utterances, the Closure Positive Shift (CPS), was utilised. The CPS has extensively been shown to be sensitive to the location of Intonational Phrase boundaries (IPh; Selkirk, 1984) in context-free spoken sentences (Steinhauer et al., 1999; Pannekamp et al., 2005). In contextually embedded utterances, on the other hand, the CPS is evident to the perception of pragmatic and/ or prosodic focus positions (Hruska et al., 2001; Johnson et al., 2003; Hruska, 2004).

The four ERP experiments reported in chapter 4 - 7 were thus designed with multiple goals. First, a clear separation of the contextual (pragmatic) vs. prosodic effects on the elicitation of the CPS in information structure was to be achieved. Second, the question whether contrastive information in discourse is per se sufficient to give rise to CPS responses received attention. Third, the processing mechanisms (as indicated by the CPS) in contextually embedded utterances without focused information were explored.

Moreover, behavioural and ERP effects of inappropriate associations of a certain pragmatic information structure with a particular accentuation pattern (prosodic information structure) were investigated.

The combining factor of all experiments was thereby the consideration of correction focus, especially its intonational and perceptual consequences.

Furthermore, participants were asked to perform the same task in all reported studies. They were asked to judge the intonational adequacy of each dialogue's last sentence in relation to its preceding context.

Experiment I explored the intonational realisation and the perceptual consequences of correction focus as opposed to novelty focus in dialogues. The analyses of the accentuation of these divergent information types revealed that correction focus is realised as a highly salient falling H*+L accent since the sentence constituents surrounding the corrected element were deaccented. In contrast, the novelty focus was realised as a rising L*+H accent.

With respect to the behavioural data, it could be concluded that novelty accents are well detectable in contexts longing for a corrective interpretation while correction accents in contexts determining novelty can be accommodated to. This finding was interpreted as a detection mechanism for accents with non-aligned stress-accent peaks (Gussenhoven, 2004). Furthermore, the behavioural results were in strong accordance with the ERP data.

Here, a centro-posterior negativity was evident only when a context gave rise to corrective information which was, however, intonationally realised as novelty. In addition, CPS patterns were attributable to the perception of each pragmatic focus position. Moreover, the appropriateness in the accentuation of the pragmatic focus positions did not contribute to the elicitation of the CPS components.

Experiment II once more explored the intonational realisation and the perceptual consequences of correction focus as opposed to novelty focus in dialogues. However, a different speaker was employed for the realisation of the materials. Moreover, the focus positions were firmly separated by contextually given information. The acoustic and phonological analyses ascertain the realisation of corrections with a salient falling H*+L accent due to the deaccentuation of the consecutive sentence constituents. Besides, the novelty focus was produced by the particular speaker as a rising L*+H accent.

The behavioural data validated that novelty accentuation is correctly rejected in contexts yearning for a corrective interpretation while correction accents in contexts inducing novelty can be accommodated to. This finding could again be interpreted as a detection mechanism for accents with non-aligned stress-accent peaks (Gussenhoven, 2004). The behavioural results were further corroborated by the ERP

data. In the ERPs, a centro-posterior negativity was apparent when a context gave rise to corrective information which was then accented as novelty. As in Experiment I, the CPS deflections were attributable to the perception of every pragmatic focus position but independent from the actual prosodic realisation of the contextually constrained foci.

Experiment III served to explore whether the contrastiveness of discourse information itself is sufficient to elicit the CPS as a neurophysiological marker of information structural processing. For this reason, the production and perception of contrastive focus information (correction) was opposed to non-focus contrastive information (i-topics). The acoustic analyses revealed highly salient accents for both information types. However, the correction accent was to be annotated as a falling H*+L while the i-topic accent was to be transcribed as a rising L*+H.

The behavioural results then also indicate that these two contrastive accents are partially interchangeable. Moreover, general problems of participants in judging the intonational realisation of i-topics became apparent.

With respect to the ERP data, the proposal of a straightforward interchange of both contrastive accents is supported. When the accents are transposed, no electrophysiological reflection for a mismatch detection is evident. However, a negative ERP is apparent in a subsequent sentence position when a correction accent is expected but not perceived. Furthermore, the reliance of the CPS on contextual constraints can be proven once more. Besides, the ERP data show that the CPS is not elicited by the perception of contrastive information per se. Rather, the contrastive information must also be focused to give rise to the CPS as the particular marker for the structuring and interpretation of discourse.

Experiment IV serves to round off the picture considering the nature of the CPS in discourse perception. For this reason, the production and perception of correction focus as opposed to contextual givenness was examined. The pre-eminent finding of this last reported study is that the absence of pragmatic foci in a discourse (overall contextual givenness) induces a switch in the processing mechanisms for spoken utterances. Listeners structure and interpret contextually embedded utterances without any focus information by means of the Intonational Phrase boundaries (IPh; Selkirk, 1984). That means that the CPS in these communication instances is elicited in accordance to IPh boundaries as in the perception of context-free single sentences (Steinhauer et al., 1999; Pannekamp et al., 2005). Furthermore, the ERP data

display a negative waveform when a context gives rise to a correction focus which is realised with the intonation of givenness, namely with a monotonal L* accent. This particular ERP finding is further corroborated by the behavioural data. Listeners are well able to detect “underspecified” correction accents but are very inconsistent in rejecting accents that are “overspecified” in relation to a certain context.

In the following, the empirical results of all four experiments will be discussed based on their individual relevance for research on linguistic prosody and psycholinguistics.

Thus, section 8.2 will be concerned with the implications of the present results to prosody research. Section 8.3 aims at illustrating the prosodic influences on listeners` behaviour. Finally, section 8.4 provides an overview of the neurophysiological reflections to language processing in discourse. In particular, the influences of pragmatic vs. prosodic information on information structural processing will be discussed, and integrated into a neurocognitive model of language perception (Friederici & Alter, 2004).

8.2 Accentuation of focus, i-topic information, and givenness in German

The speech materials for each experiment (see Appendix C) were produced in mimicked dialogue situations. The dialogues consisted of three sentences each. Every third sentence of the dialogues entered the acoustic analyses with measures on the F0 and durational properties. Moreover, the syntactic and lexico-semantic structure of the accent-bearing third sentences was held constant between conditions and experiments to avoid confounds with the segmental content (Lehiste, 1970; Umeda, 1975; Klatt, 1979).

The F0 values of each experimental condition were averaged and phonologically transcribed by means of the German Tone and Break Indices (GToBI; Grice and Baumann, 2002) and additionally motivated assumptions (see final paragraphs of section 2.1and 2.4). Moreover, lexical stress patterns were compared with the post-lexical accentual patterns of the considered sentence constituents. This procedure

allowed for the evaluation of perceptual consequences of aligned vs. non-aligned stress – to - accent peaks (Gussenhoven: 60f., 93).

In all four experiments, correction accents (condition COR) on the nuclear noun ("Anna") were elicited. They could always be attributed the same phonological structure, namely a falling H*+L accent. Thus, they consistently bore a high F0 peak on the lexically stressed first syllable, and a fall on the second syllable of nouns constantly bearing trochaic stress.

Despite of the phonological similarity, the phonetic properties of the accents differed across the employed speakers[1]. By means of the F0 excursions, it was noted that the speaker for Experiment I and III in general exhibited a much stronger F0 excursion than the speaker for Experiment II and IV. With respect to deaccentuation phenomena, both speakers diverged in the employment of pre- vs. postfocal deaccentuation (Cooper et al., 1985; Ladd, 1996; Féry, 1988, 1993). While speaker I deaccented sentence constituents preceding and following corrected information (Experiment I and III), speaker II only made use of postfocal deaccentuation, hence, on constituents following the corrected information (Experiment II and IV). However, speaker II employed deaccentuation globally in utterances comprising overall givenness (Experiment IV).

Novelty accentuation (condition NEW) in nuclear noun position ("Anna") was examined in Experiment I and II. In both experiments the novelty accent could be annotated as a rising L*+H accent. The low accent was thus aligned with the primary stressed syllable of the trochaic noun. The accentual rise, however, was found to be postponed to the secondary stressed syllable. Hence, the stress peak and the accent peak were not aligned under novelty focus. Differences between the realisations in Experiment I vs. II were again attributable to the speaker-specific F0 excursion.

An additional form of contrastive intonation was explored in Experiment III, namely i-topics (condition ITOP). By means of the phonological annotation, the accent was transcribed as a highly salient L*+H accent. That is, the high accent peak was postponed to the secondary stressed syllable as under novelty accentuation. However, the similarity in the accent pattern between condition ITOP and NEW are

[1] The materials for Experiment I and III were produced by a particular female speaker while the materials for Experiment II and IV were produced by a different female speaker.

only superficial and solely confined to the phonological structure. When considering phonetic details of the accentuation, substantial differences especially in the accents` environments become apparent.

Figure 32[1] (in Appendix B) displays the F0 course of condition ITOP (green line), of condition NEW (red line) and of condition COR (blue line) in a contiguous way. By this, first, comparisons between distinct properties of *focus* (COR and NEW) vs. *topic* (ITOP) accentuation can be drawn. Second, *highly contrastive* intonation (COR and ITOP) can be compared to at most *minimally contrastive* accentuation (NEW).

It is apparent that in both *highly contrastive* conditions (COR and ITOP) the intonation contour of the matrix clause ("Er hat mir versprochen") is strongly deaccented. The condition conveying *minimal contrast* (NEW), on the other hand, is not deaccented and exhibits a high early F0 peak close to the sentence onset.

Both *focus* conditions (NEW and COR), however, share similarities in the F0 maximum heights (278 Hz) while the *topic* condition (ITOP) comprises a lower maximum (258 Hz).

With respect to the F0 excursion in the considered accent position ("Anna"), further differences become obvious. In the *minimally contrastive* condition NEW the F0 spans 100 Hz (≈ 4 semitones of the speaker's range), and in the *highly contrastive* condition ITOP 120 Hz (≈ 5 semitones). Additionally, the duration of the rise (slope) in condition ITOP (372 msec) is more pronounced and longer lasting than in condition NEW (249 msec).

These effects are in accordance with data of Braun (2004) employing neutral and i-topic accents. Braun presented expert GToBI labellers with sentence contours elicited in a neutral topic context, and contours elicited in contrastive topic (i-topic) context. Most often, labellers chose the same phonological annotation for neutral and contrastive topics. In particular, a rising L+H accent (with the asterisk tone differing between L and H) was the most appointed accent. However, phonetic analyses revealed fine-grained acoustic differences between the two conditions. First, contrastive topics were produced with a higher and later peak. Second, the rise of the contrastive accent (slope) lasted longer than in the neutral accent. Third, the overall duration of the contrastive topics was longer, too.

[1] For this comparison only the productions of speaker I (employed for the materials of Experiment I and III) were considered to avoid confounds with the inherent different prosodic features of speaker II (employed for the materials of Experiment II and IV).

Experiment IV was concerned with a non-focus, non-contrastive kind of discourse intonation, namely the accentuation of givenness (condition GIV). The accent in nuclear position (“Anna”) was phonologically attributed a monotonal L* accent in congruence with the assumptions of Hobbs (1990). Moreover, the contextually given sentence constituents preceding and following the actual noun position were found to be deaccented. However, the IPh boundary tones are excluded from deaccentuation. While the boundary tones are also subject to declination in condition COR, the IPh boundaries of condition GIV are marked by high tones (H%; see *Figure 24*).

Taken together, the phonological annotation provides clear indications to accent structures. However, the additional consideration of phonetic properties of utterances can reveal dissimilarities in superficially similar accentuation patterns. In the work at hand, this is particularly true for the prosodic properties of novelty focus as opposed to contrastive topics. Besides, the insufficiencies of theories that propose a one-to-one association between phonological accent types and particular meanings (Pierrehumbert & Hirschberg, 1990) have been indicated.

However, it should be foregrounded again that the sentence position (i.e. the noun “Anna”) pre-eminently considered is in identical sentence position throughout the experiments. Moreover, these noun accents do consistently appear in nuclear position (following Cinque, 1993). The positive consequence of this restriction is that inherent phonetic and prosodic properties of the noun and positional effects do not confound the accent descriptions. On the other hand, it is questionable whether the present findings on accent realisation in German could be generalised to non-nuclear sentence positions, too.

8.3 The reliance of participants` behaviour on pragmatics and accentuation

In all experiments, participants were asked to judge the accentuation of each third sentence of a dialogue in relation to the preceding context sentences.

In each of the four experiments, one condition incorporated the combination of a pragmatic correction focus with the appropriate accentuation of correction focus

(condition CC). Considering condition CC, participants` behaviour was quite alike in each experiment ranging from 85.5 – 94.9 % correct responses.

Moreover, the behaviour to conditions comprising correction accentuation in noun position (“Anna”) which is, however, inadequate to the pragmatic constraints, was quite similar in Experiment I - IV (Experiment I and II: condition NC, Experiment III: condition IC, Experiment IV: condition GC). Participants judged these conditions very inconsistent which resulted in correct responses ranging from 48.2 – 58.4 %. These results indicate that the prosodic pattern of the correction accent (H*+L) is readily accommodated to in all of the considered contextual environments.

A possible explanation for this effect is delivered by Gussenhoven (2004). Based on perceptual data, he proposes that only those accents with aligned primary lexical stress and post-lexical accent peaks can induce contrastive interpretations. However, they must not assign contrastivity to discourse elements. Hence, they are more appropriate than non-aligned accents in any contextual environment. These assumptions are also in accordance with data of Bartels & Kingston (1994) and Frota (2000).

Furthermore, this interpretation is corroborated (with one exception) by the responses to the conditions determining a pragmatic correction focus in noun position (“Anna”) which is, however, prosodically realised with a non-matching accent (Experiment I and II: condition CN, Experiment IV: condition CG). In these conditions the correct responses range from 80.1 – 89.7 %. Thus, accents which fail to assign contrastiveness are well detected in contextual environments longing for a contrastive interpretation. Under the assumptions of Gussenhoven (2004) the failure in assigning contrastivity is grounded on the non-alignment of the primary stress and the post-lexical accent peak. In particular, the novelty accent (condition CN) cannot be contrastively interpreted since the high peak of the L*+H accent is postponed to a later syllable. Moreover, the givenness accent (condition CG) does not comprise a high accent peak at all.

However, one exception hinders the global interpretation of participants` behaviour in terms of stress-to-accent alignment. Condition CI of Experiment III is responded to correctly in only one-third of all instances. That means that i-topic accents in the positions of pragmatic correction foci can be ambiguously interpreted. As mentioned in section 8.2, the accents on i-topics and novelty accents display similar phonological structures in the speech materials, namely L*+H accents. So why can

the L*+H i-topic accent exchange for the correction accent but not the L*+H novelty accent?

Studies of Ladd & Morton (1997) as well as Gussenhoven (2004: 90) commonly report that *delayed* accent peaks lead to the same perceptual sensation than *high* accent peaks. Hence, both peak-delayed L*+H accents should be interpreted alike. However, Rietveld & Gussenhoven (1985) reported that the size of the F0 excursion contributes stronger to an accent's prominence than its pure peak height.

Thus, it is proposed that the i-topic and the correction accent in condition CI of Experiment III are readily interchangeable due to the late high peak of the i-topic accent which is preceded by a long and pronounced F0 slope. Novelty accents, however, cannot be interchanged with correction accents (see condition CN of Experiment I and II) as they only convey the delayed peak but a short and less expanded F0 slope.

In addition to the prosodic influences on participants` judgements discussed so far, two experimental conditions displayed results that seem to rely more strongly on general interpretation difficulties.

First, condition II of Experiment III which actually conveys appropriate combinations of pragmatic and prosodic i-topic constructions yields correct answers in only two-third of all instances. It was proposed that this is attributable to the less frequent occurrence of such discourse stretches in every-day communication. Yet, there is no data available on this phenomenon.

With respect to the results obtained for condition GG of Experiment IV which combines contextual givenness with its actually appropriate intonation, the interpretation is, however, more clear-cut. As mentioned in chapter 7, complete utterances are rarely repeated in discourse as they violate communicative maxims (Grice, 1975). Thus, it is suggested that participants do not readily accept condition GG as it does not contain considerable information centres as to the interpretation of the utterances (apart from the conjunction clause).

8.4 ERP data on information structural processing

The methodology of event-related potentials (ERPs) was employed in all four experiments to investigate the online perception of pragmatic and prosodic focus vs. diverging information types (i.e. i-topics and given information).

Each experiment consisted of four experimental conditions which were presented to listeners in dialogue settings. These incorporated two conditions with matching combinations of the pragmatic information and the prosodic realisation and two conditions with non-matching associations of the pragmatic information and the accentuation properties. [1]. In the following sections, first, the processing correlates due to the pragmatic information structure will be interpreted. Second, the consequences of the inappropriate prosodic realisation (accentuation) of certain pragmatic information types will be illustrated.

8.4.1 ERPs to pragmatic information

In all four experiments, a centro-posterior positive ERP was elicited to the perception of the pragmatic correction focus (Experiment I and II: condition CC and CN; Experiment III: condition CC and CI; Experiment IV: condition CC and CG) in the noun position (“Anna”).

In accordance with earlier ERP data on focus perception, the electrophysiological responses were interpreted as focus-induced Closure Positive Shift (Hruska et al., 2001, 2004b; Hruska, 2004a). In addition, CPS deflections were also elicited by pragmatic novelty foci (Experiment I and II: condition CC and CN) in noun (“Anna”) and verb position (“zu entlasten”).

However, Experiment III proved that the CPS is not a general brain marker for the perception of contrastive information in discourse. In the particular experiment, contexts gave rise to the interpretation of the noun (“Anna”) as contrastive topic or i-topic information, respectively (condition II and IC of Experiment III). Moreover, the particular sentences conveyed a pragmatic correction focus in the consecutive verb position (“zu entlasten”). The ERP data revealed that solely the perception of the

[1] The first letter of the condition name once more indicates the kind of conveyed *pragmatic information, and t*he second letter denotes the actual kind of *prosodic realisation*. When both letters coincide, the combination of pragmatic and prosodic information is treated as appropriate. When both letters differ, however, the pragmatic-prosodic association is inappropriate.

pragmatic *focus* position (i.e. the verb) was reflected by a CPS response. In contrast, the pragmatic *topic* information (i.e. the noun) did not elicit a CPS.

Based on these findings, it could be concluded that the CPS in discourse processing is only sensitive to pragmatic focus information but not to contrastiveness per se or topic information. This interpretation was further corroborated by Experiment IV. In this very experiment, contexts were employed which rendered all subsequent information contextually given. (i.e. condition GG and GC). The ERP data for these conditions show that the absence of pragmatic foci induces a substantial alteration in the processing mechanisms of the listeners. Similar to the processing of context-free single sentences, the CPS is apparently evoked by the perception of the Intonational Phrase boundaries in the speech signals (Steinhauer et al., 2001; Pannekamp et al., 2005).

Thus, it can be concluded that the CPS reflects the structuring and interpretation of a discourse by means of the pragmatically defined foci as long as they are present. However, when pragmatically defined information centres (foci) are absent, Intonational Phrase boundaries (IPh; Selkirk, 1984) subserve the structuring and interpretation of discourse utterances.

Moreover, the elicitation of the CPS throughout the experiments was found to be independent from the actual intonation of the focus positions. Amplitude differences in the CPS patterns varied systematically due to pragmatic constraints but not as a function of the prosodic structure[1]. In particular, contexts determining correction focus induced higher CPS amplitudes than contexts giving rise to e.g. novelty focus.

As opposed to that, inappropriate accentuation of pragmatically defined foci gave rise to distinct ERP deflections (see section 8.4.2).

8.4.2 ERPs to prosodic realisation

In all experiments, the inappropriate realisation of accents elicited negative-going waveforms. However, these ERP effects were only evident when contexts gave rise to correction foci which were not realised with the appropriate accentuation of corrections. Overall, the ERP effects are in strong accordance with the behavioural data (section 8.3).

[1] This finding is further supported by data employing the identical speech materials and ERP measurements but a different task (Toepel & Alter, 2004). The results indicate the task-independence of the CPS, and the task-dependence of the prosodic mismatch deflections.

In the Experiments I, II (condition CN) and IV (condition CG) the negative potentials (NEG) started well before the actual intonation of the noun (“Anna”) in pragmatic correction focus could be encountered. Thus, listeners seem to be able to exploit prosodic cues about a subsequent accentuation pattern before the actual noun position (i.e. in the preceding matrix clause “Er hat mir versprochen”). These cues are not unequivocal throughout the experiments since the speakers employed different strategies to highlight correction accents. Thus, no generalisation as to the evoking prosodic cues of the negative ERP can be drawn. However, there is some indication that listeners can make use of diverging intonational cues.

In particular, speaker 1 (Experiment I) deaccented sentence elements preceding the correction accent. Thus, the absence of deaccentuation (in condition CN) could initially trigger the negativity (NEG). Speaker 2 (Experiment II), on the other hand, utilises a compressed F0 range (in condition CN). Hence, the broader F0 excursion (in condition CN) might initially be responsible for the negative-going waveform. Moreover, speaker 2 displays diverging sentence-initial intonation patterns for corrections vs. givenness which might contribute to the elicitation of the negative ERP.

However, the negativities do also peak in temporal relation to the inappropriate noun accent (“Anna”). Thus, the so-proposed non-aligned accents (see section 8.2) substantially contribute to the negative ERP as well.

Experiment III, on the opposite, presents an exception in this respect. Since no negative waveform is apparent to the perception of condition CI, the correction and the i-topic accents seem to be interchangeable (see also section 8.3). Furthermore, condition IC of Experiment III demonstrates that a “missing” correction accent on the verb (“zu entlasten”) is reflected by a negative event-related potential as well.

With reference to the neurophysiological affiliation of the negative ERP component, speculations seem premature. Yet, similar prosodically driven negativities have been described in the literature. Holcomb & Neville (1991) interpreted a prosodically induced posterior negativity with a peak latency of 150 msec as an early N400 onset. Hayashi et al. (2001) reported an accent-driven temporal and parietal negative MEG response around 250 msec. Moreover, Pannekamp et al. (2005) reported a centro-posterior negativity with an onset latency of 300 msec to the detection of a deviant prosodic pattern.

However, in the data at hand the intonation of the matrix clause jitters the onset of the negativities which aggravates assertions about the temporal dimensions of the component. For this reason, a continuative experimental design is suggested in section 8.5 which could serve to solve this problem.

8.4.3 Implications of the ERP findings on a (neuro)cognitive model of language perception

Based on the data at hand an attempt is presented to integrate ERP effects on context-free vs. context-embedded utterance processing. Thereby, an extension of the "Dynamic dual pathway model" as proposed by Friederici & Alter (2004) is suggested (*Figure 27*). The model of Friederici & Alter is, however, strongly based on findings of hemispheric specialisations for the perception of differing linguistic aspects. The findings of the thesis at hand cannot provide statements in this regard as the employed ERP methodology is rather insensitive for the topographical specification of language perception aspects in the brain.

On the other hand, the *dual pathway model* basically proposes diverging pathways for the processing of prosodic as opposed to other linguistic information (e.g. syntactic and semantic information). Since the current ERP data also suggest that pragmatic and prosodic information are processed rather independently from each other (elicitation of the CPS vs. the negative ERP), the underlying structure of the *dual pathway model* is adapted here.

In particular, the model proposes a processing pathway for context-free sentence-level prosody apart from the construction of syntactic-semantic representations of sentences. However, both information sources contribute to the final interpretation of context-free utterances (mainly the left part of *Figure 27*).

The extension of the model (mainly the right part of *Figure 27*) is supposed to account for the processing strategies on context-embedded (or discourse-connected) utterances. It is proposed that a pragmatic and a prosodic analysis take place. The pragmatic analysis scans the input for pragmatic focus information. If pragmatic foci are present, they serve to structure and interpret the language input directly. Evidence for this direct interpretation pathway is provided by the elicitation of the focus-induced CPS in Experiment I-IV. Does the input, however, not convey

pragmatic focus positions, listeners make use of the major prosodic boundaries (and the pitch accentuation) to structure the speech input (as in Experiment IV).

Moreover, on a separate prosodic pathway the focus accentuation is analysed. Here, deviant prosodic patterns can be detected by taking into account information about the pragmatic foci. However, these accent mismatch detections do not substantially contribute to the final interpretation of context-embedded utterances as the pragmatic focus information enters the final interpretation by the direct path. Evidence for this connection comes from the elicitation of the negative ERP in Experiment I-IV. Deviant intonation patterns can, in addition, be detected in context-free utterances. ERP evidence for this processing path was provided in the end of section 8.4.2.

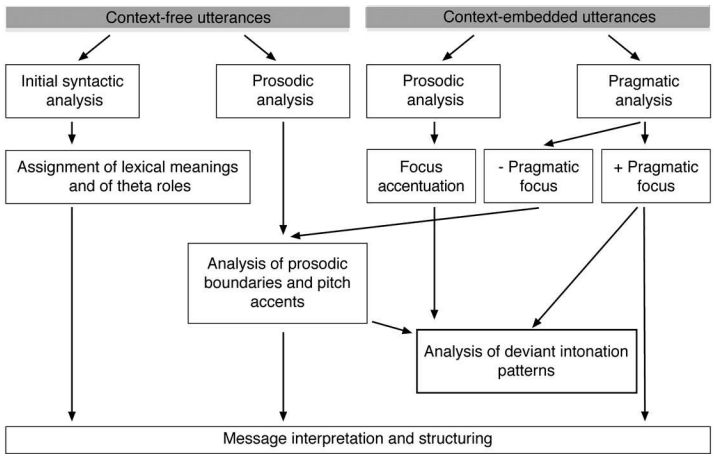

Figure 27: *Model of spoken language processing in the absence and presence of context information (based on Friederici & Alter, 2004).*

However, the proposed model is in need of substantial support or modification from future research on discourse processing. Some conceivable directions are sketched in section 8.5. Moreover, the information sources included in the above model are by no means exhaustive. Furthermore, neurocognitive evidence as to the exact time-course and topographical localisation of the CPS and the negative ERP response in spoken language processing are lacking. However, there is some indication from a combined ERP and MEG study exploring structural phrasing in music that the CPS component has probably more than one neural generator (Knösche, Neuhaus, Haueisen, Alter, Maess, Witte & Friederici, 2005). In particular,

the Knösche et al. study reported the anterior and posterior cingulate cortex and the posterior mediotemporal cortex of both hemispheres as the most likely candidates for the generation of the CPS.

8.5 Some final considerations including future research directions

As mentioned beforehand, the temporal dimensions of the CPS in pragmatic focus processing could not be determined unequivocally under the employed test design. Moreover, this is true for the negative ERP for incorrect accentuation patterns in discourse. Thus, for a definite implementation of these ERP components into a neurophysiological language processing model incorporating temporal aspects (e.g. Friederici, 2002) a different experimental design seems favourable. As prosodic information has been shown to lead to early ERP deflections, accentuation cues preceding the actual focus position must be eliminated. In a non-artificial way, this could be done by creating a dialogue corpus determining pragmatic focus positions on sentence-initial nouns (i.e. by a context question starting with “Who?” or a noun to be contrasted). In these sentence types, no F0 reference line can be established before the pragmatic focus position. Thus, listeners can only rely on the pragmatic information and on the sentence-initial accentuation pattern to interpret the pragmatic focus position. In turn, the responses to the pragmatic focus position and to inappropriate accentuation patterns will be clearly time-locked to the onset of the focus. Furthermore, the experimental paradigm could allow for the investigation of discourse processing mechanisms in second language learning (L2). Thereby, the reliance of L2 learners of German on pragmatic vs. prosodic focus information could be evaluated. Especially the prosodic focus properties do vary substantially between languages (see Frota, 2000; Gussenhoven, 2004). On the other hand, the pragmatic constraints as to the interpretation of context-embedded utterances are quite invariant. Thus, it is hypothesised that L2 learners rely more strongly on pragmatic information to interpret utterances in discourse than on their prosodic realisation (when no syntactic focus markings are present). With respect to the ERP responses, such behaviour should not imply consequences for the pragmatically driven CPS. However, negative-going ERPs to mismatches between the pragmatic foci and the accentuation might not be evident as accent mismatches are possibly not detected. First behavioural evidence as to the reliance of second language learners on

pragmatic focusing devices (here: Dutch speakers proficient in English) were presented by Akker & Cutler (2003).

With respect to first language acquisition (L1), the "Prosodic Bootstrapping" account claims that from very early age onwards children make use of prosodic cues to guide speech segmentation (Jusczyk, 1997). These cues incorporate word stress and prosodic boundaries, and e.g. serve to learn the particular syntactic structure of the language to be acquired. Yet, knowledge is far from complete when children start to make use of verbal pragmatic information to interpret and structure context-embedded utterances. Moreover, children must have acquired some prerequisites before being enabled to use verbal pragmatics as a processing guide. First, a certain vocabulary size must have been acquired. Second, children must be able to understand focus-inducing wh-words as they, e.g. imply the interpretation of certain sentence constituents as novelty focus. Research on the perception of wh-questions indicates that children around 2.6 years are able to understand these types of questions although not responding to them verbally like adults (Penner & Kölliker Funk, 1998). Moreover, there is some indication that children at the age of four can maintain discourse structures in peer interaction, and do not simplify their content anymore (Karmiloff & Karmiloff-Smith, 2001). On the other hand, Kail (1989) reported that children at the age of 3.6 years still heavily rely on prosodic highlighting to identify discourse information. In situations where prosodic and syntactic cues are in conflict, even children at the age of seven resolve these conflicts in favour of a prosody-based interpretation (Read & Schreiber, 1982). To summarise, prosody is the first available speech interpretation cue. Besides, experimental evidence supports that this cue is exploited by L1 learners. Thus, it is hypothesised that children's processing of context-embedded utterances strongly relies on prosodic focus positions. However, adults structure such utterances on the basis of pragmatic information (as reflected by the elicitation of the focus-bound CPS throughout the thesis at hand). Thus, an ERP design with simplified discourse productions could serve to investigate the ontogenetic properties of the pragmatics-prosody-interface. By testing age groups from 3 years up to puberty, the time point of the transformation in processing mechanisms from prosody-bound to pragmatics-bound discourse understanding could be explored.

Insights from the differing age groups could substantially enhance our knowledge about the language acquisition mechanisms in man.

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Appendix A Statistical tables

Table 20: *Comparison of the durational properties in the materials of Experiment I.*

		t value	***Significance level***	***Pattern***
	Sentence	t[86] = 0.68	n.s.	
Mat	***Matrix clause***	t[86] = 6.92	p ≤.01	NEW > COR
SylMat	***Last syllable of matrix clause***	t[86] = 3.92	p ≤ .01	NEW > COR
P1	***Pause 1***	t[86] = 7.44	p ≤ .01	NEW > COR
Noun	***Noun***	t[86] = 3.16	p ≤ .01	COR > NEW
SylNoun	***Last syllable of noun***	t[86] = 1.75	n.s.	
P2	***Pause 2***	t[86] = 0.48	n.s.	
Verb	***Verb***	t[86] = 2.18	p ≤ .05	COR > NEW
SylVerb	***Last syllable of verb***	t[86] = 1.68	n.s.	
P3	***Pause 3***	t[86] = 9.99	p ≤ .01	COR > NEW
Con	***Conjunction clause***	t[86] = 3.97	p ≤ .01	NEW > COR

Table 21: *Comparison of the durational properties in the materials of Experiment II.*

		t value	***Significance level***	***Pattern***
	Sentence	t[86] = 1.36	n.s.	
Mat	***Matrix clause***	t[86] = 0.38	n.s.	
SylMat	***Last syllable of matrix clause***	t[86] = 2.01	p ≤ .05	NEW > COR
P1	***Pause 1***	t[86] = 1.89	n.s.	
Noun	***Noun***	t[86] = 4.42	p ≤ .01	COR > NEW
SylNoun	***Last syllable of noun***	t[86] = 2.29	p ≤ .01	COR > NEW
P2	***Pause 2***	t[86] = 0.60	n.s.	
Adj	***Adjunct***	t[86] = 0.98	n.s.	
P3	***Pause3***	t[86] = 0.54	n.s.	
Verb	***Verb***	t[86] = 1.94	n.s.	
SylVerb	***Last syllable of verb***	t[86] = 1.89	n.s.	
P4	***Pause 4***	t[86] = 2.57	p ≤ .05	NEW > COR
Con	***Conjunction clause***	t[86] = 0.08	n.s.	

Table 22: *Comparison of the durational properties in the materials of Experiment III.*

		t value	***Significance level***	***Pattern***
	Sentence	t[86] = 7.82	p ≤ .01	ITOP > COR
Mat	***Matrix clause***	t[86] = 3.39	p ≤ .01	ITOP > COR
SylMat	***Last syllable of matrix clause***	t[86] = 0.89	n.s.	
P1	***Pause 1***	t[86] = 3.56	p ≤ .01	ITOP > COR
Noun	***Noun***	t[86] = 5.57	p ≤ .01	ITOP > COR
SylNoun	***Last syllable of noun***	t[86] = 2.51	p ≤ .05	ITOP > COR
P2	***Pause 2***	t[86] = 2.54	p ≤ .05	ITOP > COR
Verb	***Verb***	t[86] = 7.00	p ≤ .01	ITOP > COR
SylVerb	***Last syllable of verb***	t[86] = 7.00	p ≤ .01	ITOP > COR
P3	***Pause 3***	t[86] = 3.17	p ≤ .01	COR > ITOP
Con	***Conjunction clause***	t[86] = 3.42	p ≤ .01	ITOP > COR

Table 23: *Comparison of the durational properties in the materials of Experiment IV.*

		t value	***Significance level***	***Pattern***
	Sentence	t[86] = 4.24	p ≤ .01	COR > GIV
Mat	***Matrix clause***	t[86] = 0.43	n.s.	
SylMat	***Last syllable of matrix clause***	t[86] = 3.54	p ≤ .01	GIV > COR
P1	***Pause 1***	t[86] = 1.9	n.s.	
Noun	***Noun***	t[86] = 5.16	p ≤ .01	COR > GIV
SylNoun	***Last syllable of noun***	t[86] = 4.16	p ≤ .01	COR > GIV
P2	***Pause 2***	t[86] = 2.79	p ≤ .01	COR > GIV
Verb	***Verb***	t[86] = 0.82	n.s.	
SylVerb	***Last syllable of verb***	t[86] = 1.48	n.s.	
P3	***Pause 3***	t[86] = 3.67	p ≤ .01	COR > GIV
Con	***Conjunction clause***	t[86] = 0.16	n.s.	

Table 24: *F0 values in the materials of Experiment I.*

Region between markers		***Correction in noun position***		***New information in noun and verb position***	
		F0 in Hz	***Time point in msec***	***F0 in Hz***	***Time point in msec***
1-2	on	187	122	178	113
	max	197	225	287	506
	min	132	577	124	677
	off	135	670	124	714
2-3	on	132	722	128	791
	max	143	838	231	1284
	min	120	1103	122	820
	off	121	1198	228	1304
4-5	on	173	1345	181	1525
	max	278	1498	242	1674
	min	171	1360	178	1545
	off	269	1517	239	1682
5-6	on	244	1567	260	1714
	max	246	1576	278	1774
	min	133	1687	245	1751
	off	133	1693	259	1833
7-8	on	135	1837	147	1997
	max	144	1960	152	2029
	min	118	2026	124	2071
	off	120	2222	126	2123
8-9	on	120	2260	130	2178
	max	135	2415	232	2583
	min	118	2302	126	2235
	off	132	2470	210	2653
10-11	on	203	2798	152	2729
	max	255	3230	236	3671
	min	114	3675	106	3529
	off	128	4162	118	4194

Table 25: *F0 values in the materials of Experiment II.*

Region between markers		***Correction in noun position***		***New information in noun and verb position***	
		F0 in Hz	***Time point in msec***	***F0 in Hz***	***Time point in msec***
1-2	on	216	116	201	93
	max	270	361	270	353
	min	186	472	179	427
	off	190	573	184	561
2-3	on	188	647	175	619
	max	266	920	289	945
	min	180	686	161	678
	off	254	975	273	987
4-5	on	220	1365	211	1386
	max	233	1448	245	1487
	min	210	1431	206	1397
	off	221	1509	250	1500
5-6	on	206	1573	257	1559
	max	208	1585	269	1600
	min	172	1685	225	1630
	off	174	1698	232	1663
7-8	on	175	1810	184	1765
	max	192	2082	244	2078
	min	166	1972	164	1901
	off	175	2226	208	2205
9-10	on	204	2372	194	2382
	max	205	2407	195	2397
	min	181	2428	170	2448
	off	185	2483	173	2470
10-11	on	185	2564	173	2546
	max	197	2704	260	2829
	min	173	2718	169	2585
	off	181	2895	244	2917
12-13	on	199	3108	207	3176
	max	246	3629	238	3530
	min	128	3817	132	3819
	off	170	4355	160	4435

Table 26: *F0 values in the materials of Experiment III.*

Region between markers		***Correction in noun position***		***I-topic in noun position and correction in verb position***	
		F0 in Hz	***Time point in msec***	***F0 in Hz***	***Time point in msec***
1-2	on	187	115	188	122
	max	197	159	199	188
	min	132	795	131	859
	off	135	916	134	966
2-3	on	132	939	129	999
	max	143	1000	139	1062
	min	120	1109	120	1154
	off	121	1162	122	1217
4-5	on	173	1294	143	1443
	max	278	1445	194	1635
	min	171	1304	139	1480
	off	269	1472	194	1660
5-6	on	244	1534	207	1695
	max	246	1537	258	1815
	min	133	1672	198	1725
	off	133	1676	247	1866
7-8	on	135	1835	135	2072
	max	144	1924	148	2346
	min	119	2111	117	2210
	off	120	2222	149	2500
8-9	on	120	2260	166	2547
	max	133	2415	313	2786
	min	118	2302	166	2547
	off	130	2470	297	2821

Table 27: *F0 values in the materials of Experiment IV.*

Region between markers		***Correction in noun position***		***Given information in noun position***	
		F0 in Hz	***Time point in msec***	***F0 in Hz***	***Time point in msec***
1-2	on	211	105	210	102
	max	265	357	230	315
	min	176	433	177	437
	off	183	588	180	540
2-3	on	186	666	176	616
	max	258	913	280	897
	min	175	715	162	714
	off	238	974	241	977
4-5	on	216	1243	212	1175
	max	238	1315	220	1219
	min	210	1305	199	1229
	off	222	1372	209	1276
5-6	on	203	1433	202	1339
	max	218	1445	208	1356
	min	169	1530	181	1414
	off	171	1549	183	1430
7-8	on	193	1705	196	1579
	max	194	1727	196	1587
	min	172	1753	170	1634
	off	173	1796	172	1665
8-9	on	176	1886	178	1771
	max	191	2036	271	2022
	min	163	2064	184	1825
	off	171	2226	245	2110
10-11	on	200	2478	201	2276
	max	243	3004	233	2588
	min	136	3258	105	2881
	off	164	3756	163	3544

Table 28: *F0 values in the context questions of Experiment IV.*

Region between markers		***Correction in noun position***		***Given information in noun position***	
		F0 in Hz	***Time point in msec***	***F0 in Hz***	***Time point in msec***
1-2	on	184	125	209	127
	max	203	360	217	221
	min	124	613	129	843
	off	161	1006	149	1178
3-4	on	180	1146	161	1315
	max	265	1315	191	1510
	min	175	1168	155	1368
	off	262	1323	190	1547
4-5	on	255	1376	215	1609
	max	269	1402	262	1735
	min	201	1460	213	1617
	off	226	1489	256	1742
6-7	on	187	1651	293	1926
	max	206	1672	297	1949
	min	152	1715	252	1989
	off	174	1776	267	2050
7-8	on	158	1824	267	2143
	max	276	2190	337	2501
	min	132	1966	247	2189
	off	269	2191	335	2506

Table 29: *Results of the three-way analysis of variance for the ERP data of Experiment I.*

Average from	***TW***	***Comparison of conditions***	
		CC vs. NC	
Post sentence onset	***800-1800 msec***	n.s	
Post matrix clause offset	***0-500 msec***	n.s.	
	500-1000 msec	COND	F(1,20)= 34.83; p≤.01
	1000-1500 msec	COND	F(1,20)= 22.96; p≤.01
	1500-2000 msec	COND	F(1,20)= 15.63; p≤.01
		COND x HEM x REG	F(2,40)= 3.37; p≤.05
		NN vs. CN	
Post sentence onset	***800-1800 msec***	COND	F(1,20)= 4.39; p≤.05
Post matrix clause offset	***0-500 msec***	n.s.	
	500-1000 msec	COND	F(1,20)= 30.91; p≤.01
	1000-1500 msec	COND	F(1,20)= 47.49; p≤.01
		COND x REG	F(2,40)= 15.44; p≤.01
		COND x HEM x REG	F(2,40)= 12.01; p≤.01
	1500-2000 msec	COND	F(1,20)= 24.76; p≤.01

Table 30: *Results of the three-way analysis of variance for the ERP data of Experiment II.*

Average from	***TW***	***Comparison of conditions***	
		CC vs. NC	
Post sentence onset	***1100-1600 msec***	n.s.	
Post matrix clause offset	***0-500 msec***	COND x HEM	F(1,20)= 6.59; p≤.05
	500-1000 msec	COND	F(1,20)= 17.62; p≤.01
	1000-1500 msec	COND	F(1,20)= 7.78; p≤.05
	1500-2000 msec	COND x HEM x REG	F(2,40)= 6.43; p≤.01
	2000-2500 msec	COND x HEM x REG	F(2,40)= 7.14; p≤.01
	2500-3000 msec	COND x REG	F(2,40)= 4.35; p≤.05
		COND x HEM x REG	F(2,40)= 6.32; p≤.05
		NN vs. CN	
Post sentence onset	***1100-1600 msec***	COND	F(1,20)= 11.82; p≤.01
Post matrix clause offset	***0-500 msec***	COND	F(1,20)= 5.16; p≤.05
		COND x REG	F(2,40)= 5.93; p≤.05
	500-1000 msec	COND	F(1,20)= 8.05; p≤.01
		COND x REG	F(2,40)= 10.06; p≤.01
		COND x HEM x REG	F(2,40)= 5.75; p≤.01
	1000-1500 msec	COND	F(1,20)= 15.80; p≤.01
		COND x REG	F(2,40)= 15.44; p≤.01
		COND x HEM x REG	F(2,40)= 12.01; p≤.01
	1500-2000 msec	COND	F(1,20)= 6.58; p≤.05
		COND x REG	F(2,40)= 18.21; p≤.01
		COND x HEM x REG	F(2,40)= 12.17; p≤.01
	2000-2500 msec	COND x HEM	F(1,20)= 7.55; p≤.05
		COND x REG	F(2,40)= 4.25; p≤.05
		COND x HEM x REG	F(2,40)= 12.07; p≤.01
	2500-3000 msec	COND x HEM	F(1,20)= 8.38; p≤.01
		COND x HEM x REG	F(2,40)= 8.65; p≤.01

Table 31: *Results of the three-way analysis of variance for the ERP data of Experiment III.*

Average from	***TW***	***Comparison of conditions***	
		CC vs. IC	
Post sentence onset	***1100-1600 msec***	COND x HEM	F(1,20)= 7.57; p≤.05
Post matrix clause offset	***0-500 msec***	COND x HEM	F(1,20)= 6.59; p≤.05
	500-1000 msec	COND	F(1,20)= 13.76; p≤.01
		COND x HEM	F(1,20)= 8.93; p≤.01
		COND x HEM x REG	F(2,40)= 3.54; p≤.05
	1000-1500 msec	COND x HEM	F(1,20)= 10.68; p≤.01
		COND x HEM x REG	F(2,40)= 3.85; p≤.05
	1500-2000 msec	COND x HEM	F(1,20)= 15.48; p≤.01
		COND x HEM x REG	F(2,40)= 4.42; p≤.05
		II vs. CI	
Post sentence onset	***1100-1600 msec***	COND x REG	F(2,40)= 6.74; p≤.01
Post matrix clause offset	***0-500 msec***	n.s.	
	500-1000 msec	COND x REG	F(2,40)= 4.53; p≤.05
	1000-1500 msec	COND x HEM	F(1,20)= 7.19; p≤.05
		COND x HEM x REG	F(2,40)= 6.09; p≤.01
	1500-2000 msec	COND	F(1,20)= 4.98; p≤.05
		COND x HEM x REG	F(2,40)= 6.05; p≤.01

Table 32: *Results of the three-way analysis of variance for the ERP data of Experiment IV.*

Average from	***TW***	***Comparison of conditions***	
		CC vs. GC	
Post sentence onset	***1100-1600 msec***	n.s.	
Post matrix clause offset	***0-500 msec***	COND x REG	F(2,42)= 15.35; p≤.01
	500-1000 msec	COND x HEM x REG	F(2,42)= 7.30; p≤.01
	1000-1500 msec	COND x HEM	F(1,21)= 6.56; p≤.05
		COND x HEM x REG	F(2,42)= 11.24; p≤.01
	1500-2000 msec	COND x HEM	F(1,21)= 15.48; p≤.01
		COND x HEM x REG	F(2,42)= 4.42; p≤.05
		GG vs. CG	
Post sentence onset	***1100-1600 msec***	COND x REG	F(2,42)= 9.90; p≤.01
Post matrix clause offset	***0-500 msec***	COND	F(1,21)= 9.35; p≤.01
		COND x REG	F(2,42)= 5.54; p≤.05
	500-1000 msec	n.s.	
	1000-1500 msec	COND x REG	F(2,42)= 6.65; p≤.05
		COND x HEM x REG	F(2,42)= 5.03; p≤.05
	1500-2000 msec	COND x REG	F(2,42)= 8.23; p≤.01

Appendix B Additional figures

Figure 28: *ERPs (5 Hz low pass filtered) averaged at the verb ("zu entlasten") in Experiment III. The left part of the figure illustrates responses to correction accents on the noun in matching (CC [solid]) and non-matching context (IC [dotted]). The right part depicts the ERPs for i-topic accents on the noun + corrective accentuation on the verb in matching (solid: II) and non-matching (dotted: CI).*

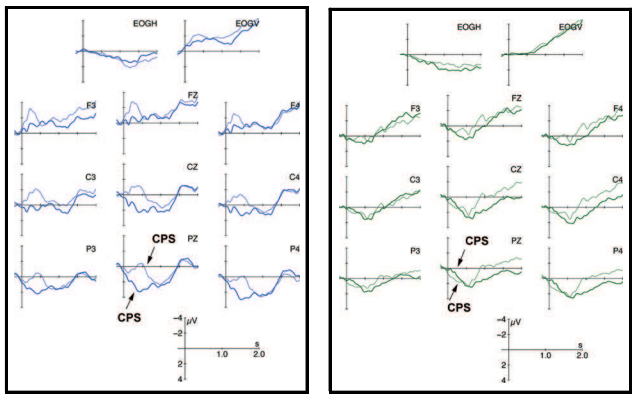


Figure 29: *Context-dependent ERPs (5 Hz low pass filtered) illustrating responses for given information in the left panel (black= GG, blue= GC) and correction information in the right panel (blue= CC, black= CG). The averages start at the onset of the last syllable of the first verb (SylVerb; underlined) of the third dialogue sentences ("versprochen").*

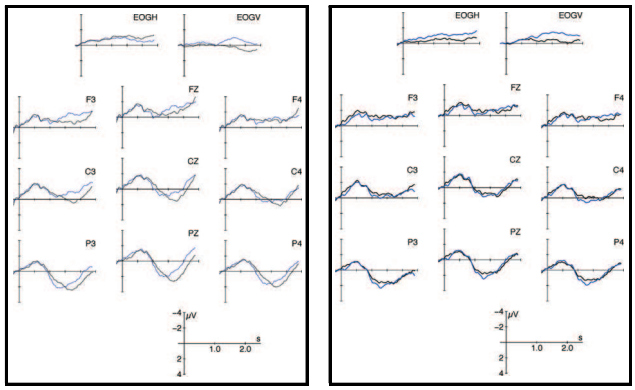


***Figure 30**: F0 course in the context questions of Experiment IV (blue= correction context, black= all given context).*

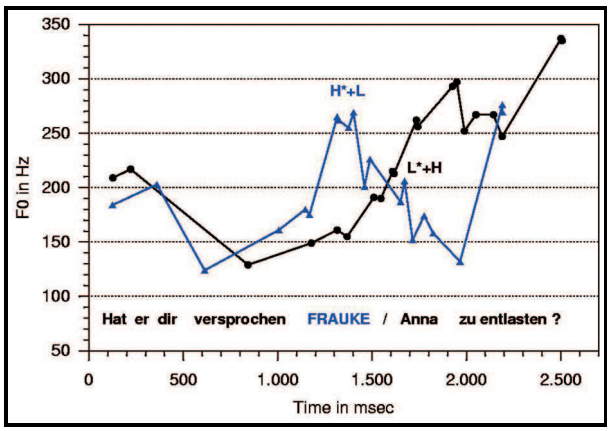
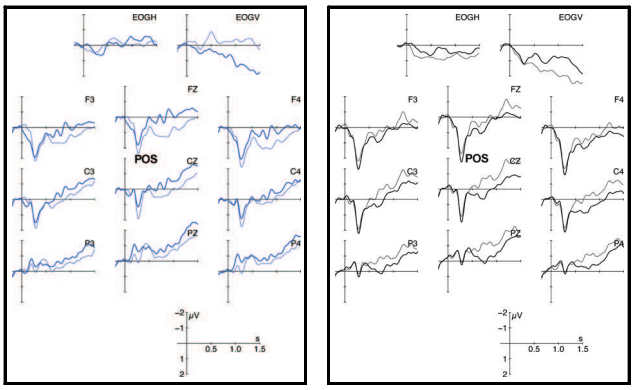


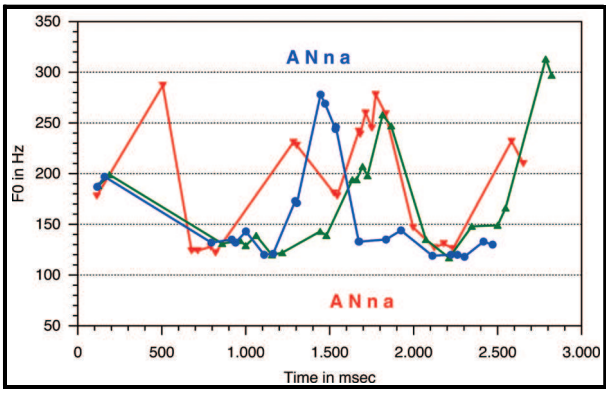
***Figure 31:** Differing ERP patterns to the context questions in Experiment IV (blue= consecutive correction accent; black= consecutive [-focus] accentuation). The solid lines depict responses to consecutive matching intonation, and the dotted lines to consecutive non-matching accentuation. The colour code of the conditions is similar to the code in Figure 25 and Figure 26.*



Solid blue line: Condition CC
Dotted blue line: Condition GC

Solid black line: Condition GG
Dotted black line: Condition CG

Figure 32: *Overview of all experimental sentences produced by speaker 1 (blue= correction on the noun [COR]; red= novelty on the noun and the verb [NEW]; green= i-topic in noun position and correction on the consecutive verb [ITOP].)*



Appendix C Overview of the experimental materials

Experiment I, III, IV: Dialogues with correction focus;
Dialogues with given information only differ in the questioned noun (which is then similar between question and answer)

01a Am Samstag hat Peter mir etwas versprochen.
01b Hat er Dir versprochen, Frauke zu entlasten?
01c Er hat mir versprochen, Anna zu entlasten und die Küche zu putzen.
02a Am Montag hat Rosa mir etwas versprochen.
02b Hat sie Dir versprochen, Karsten zu besuchen?
02c Sie hat mir versprochen, Helmut zu besuchen und den Konflikt zu schlichten.
03a Am Dienstag hat Achim mir etwas versprochen.
03b Hat er Dir versprochen, Lisa zu loben?
03c Er hat mir versprochen, Steffen zu loben und das Gehalt zu erhöhen.
04a Am Sonntag hat Dörthe mir etwas versprochen.
04b Hat sie Dir versprochen, Nora zu belügen?
04c Sie hat mir versprochen, Elke zu belügen und die Trennung zu vermeiden.
05a Am Freitag hat Udo mir etwas verboten.
05b Hat er Dir verboten, Jürgen zu ärgern?
05c Er hat mir verboten, Jutta zu ärgern und die Eltern zu enttäuschen.
06a Am Dienstag hat Heidi mir etwas verboten.
06b Hat sie Dir verboten, Karin zu verstecken?
06c Sie hat mir verboten, Hartmut zu verstecken und die Polizei zu rufen.
07a Am Mittwoch hat Arthur mir etwas verboten.
07b Hat er Dir verboten, Sandra zu entlassen?
07c Er hat mir verboten, Ingo zu entlassen und die Firma zu gefährden.
08a Am Samstag hat Eva mir etwas verboten.
08b Hat sie Dir verboten, Holger zu beleidigen?
08c Sie hat mir verboten, Anja zu beleidigen und die Ruhe stören.
09a Am Freitag hat Rudolf mir etwas erlaubt.
09b Hat er Dir erlaubt, Martin zu treffen?
09c Er hat mir erlaubt, Carmen zu treffen und den Bericht zu schreiben.
10a Am Montag hat Petra mir etwas erlaubt.
10b Hat sie Dir erlaubt, Helga zu fördern?
10c Sie hat mir erlaubt, Markus zu fördern und das Studium zu zahlen.
11a Am Dienstag hat Konrad mir etwas erlaubt.
11b Hat er Dir erlaubt, Manja zu pflegen?
11c Er hat mir erlaubt, Walter zu pflegen und die Grippe zu kurieren.
12a Am Mittwoch hat Sofie mir etwas erlaubt.
12b Hat sie Dir erlaubt, Lukas zu wecken?
12c Sie hat mir erlaubt, Kerstin zu wecken und das Training zu beginnen.
13a Am Freitag hat Werner mir etwas befohlen.
13b Hat er Dir befohlen, Lore zu suchen?
13c Er hat mir befohlen, Lena zu suchen und den Garten zu überprüfen.
14a Am Samstag hat Sandra mir etwas befohlen.
14b Hat sie Dir befohlen, Nina zu ehren?
14c Sie hat mir befohlen, Günther zu ehren und den Empfang zu besuchen.
15a Am Sonntag hat Egon mir etwas befohlen.
15b Hat er Dir befohlen, Franka zu stützen?
15c Er hat mir befohlen, Nico zu stützen und den Notarzt zu rufen.
16a Vorgestern hat Silke mir etwas befohlen.
16b Hat sie Dir befohlen, Achim zu fordern?
16c Sie hat mir befohlen, Jana zu fordern und das Training zu verlängern.
17a Vorgestern hat Harald mir bei etwas geholfen.
17b Hat er Dir geholfen, Maja zu fesseln?
17c Er hat mir geholfen, Sigrid zu fesseln und die Klinik zu informieren.
18a Letztes Jahr hat Marga mir bei etwas geholfen.
18b Hat sie Dir geholfen, Thomas zu führen?
18c Sie hat mir geholfen, Lukas zu führen und den Rückweg zu finden.

19a Am Mittwoch hat Johann mir bei etwas geholfen.
19b Hat er Dir geholfen, Anke zu beruhigen?
19c Er hat mir geholfen, Reinhard zu beruhigen und die Feier zu retten.
20a Letztes Jahr hat Lotte mir bei etwas geholfen.
20b Hat sie Dir geholfen, Heinrich zu trösten?
20c Sie hat mir geholfen, Magda zu trösten und die Gäste zu bewirten.
21a Vorgestern hat Simon mir etwas geschworen.
21b Hat er Dir geschworen, Magda zu tragen?
21c Er hat mir geschworen, Uta zu tragen und den Knöchel zu schonen.
22a Am Montag hat Vera mir etwas geschworen.
22b Hat sie Dir geschworen, Simon zu täuschen?
22c Sie hat mir geschworen, Dietmar zu täuschen und die Akten zu vernichten.
23a Vorgestern hat Robert mir etwas geschworen.
23b Hat er Dir geschworen, Nadja zu befreien?
23c Er hat mir geschworen, Maja zu befreien und die Frauen zu vergessen.
24a Am Dienstag hat Lisa mir etwas geschworen.
24b Hat sie Dir geschworen, Suse zu fangen?
24c Sie hat mir geschworen, Doris zu fangen und den Schaden zu ersetzen.
25a Am Mittwoch hat Sascha mir etwas versichert.
25b Hat er Dir versichert, Hendrik zu verwöhnen?
25c Er hat mir versichert, Maja zu verwöhnen und den Urlaub zu bezahlen.
26a Am Freitag hat Uschi mir etwas versichert.
26b Hat sie Dir versichert, Moritz zu retten?
26c Sie hat mir versichert, Dietrich zu retten und die Schulden zu begleichen.
27a Am Samstag hat Gregor mir etwas versichert.
27b Hat er Dir versichert, Anja zu finden?
27c Er hat mir versichert, Detlef zu finden und die Probleme zu klären.
28a Am Sonntag hat Käthe mir etwas versichert.
28b Hat sie Dir versichert, Rene zu verabschieden?
28c Sie hat mir versichert, Ingrid zu verabschieden und die Rückfahrt zu zahlen.
29a Letztes Jahr hat Eckhardt mich um etwas gebeten.
29b Hat er Dich gebeten, Lore zu begrüßen?
29c Er hat mich gebeten, Inge zu begrüßen und den Ausflug zu unterbrechen.
30a Vorgestern hat Tina mich um etwas gebeten.
30b Hat sie Dich gebeten, Jonas zu holen?
30c Sie hat mich gebeten, Phillip zu holen und den Schaden zu zeigen.
31a Vorgestern hat Werner mich um etwas gebeten.
31b Hat er Dich gebeten, Karla zu kämmen?
31c Er hat mich gebeten, Gerhard zu kämmen und die Frisur zu ordnen.
32a Am Montag hat Esther mich um etwas gebeten.
32b Hat sie Dich gebeten, Otto zu verfolgen?
32c Sie hat mich gebeten, Birgit zu verfolgen und das Auto zu benutzen.
33a Am Dienstag hat Erwin mir etwas geraten.
33b Hat er Dir geraten, Martin zu verlassen?
33c Er hat mir geraten, Stefan zu verlassen und die Chance zu nutzen.
34a Am Mittwoch hat Tanja mir etwas geraten.
34b Hat sie Dir geraten, Stefan zu schonen?
34c Sie hat mir geraten, Rainer zu schonen und die Ärztin zu konsultieren.
35a Am Freitag hat Georg mir etwas geraten.
35b Hat er Dir geraten, Karsten zu vergessen?
35c Er hat mir geraten, Stefan zu vergessen und den Urlaub zu genießen.
36a Am Samstag hat Ella mir etwas geraten.
36b Hat sie Dir geraten, Kerstin zu unterstützen?
36c Sie hat mir geraten, Iris zu unterstützen und den Ärger zu vergessen.
37a Am Sonntag hat Volker mir etwas gestanden.
37b Hat er Dir gestanden, Steffie zu betrügen?
37c Er hat mir gestanden, Lore zu betrügen und die Freundin zu hintergehen.
38a Vorgestern hat Steffie mir etwas gestanden.
38b Hat sie Dir gestanden, Peter zu lieben?
38c Sie hat mir gestanden, Holger zu lieben und den Verstand zu verlieren.
39a Letztes Jahr hat Armin mir etwas gestanden.
39b Hat er Dir denn gestanden, Petra zu kennen?

39c Er hat mir gestanden, Norbert zu kennen und die Freundschaft zu schätzen.
40a Vorgestern hat Christa mir etwas gestanden.
40b Hat sie Dir gestanden, Simon zu fürchten?
40c Sie hat mir gestanden, Hanna zu fürchten und den Verstand zu verlieren.
41a Am Montag hat Henning mir etwas empfohlen.
41b Hat er Dir empfohlen, Ines zu schützen?
41c Er hat mir empfohlen, Moni zu schützen und den Anwalt einzuschalten.
42a Letztes Jahr hat Ines mir etwas empfohlen.
42b Hat sie Dir empfohlen, Markus zu ruinieren?
42c Sie hat mir empfohlen, Jochen zu ruinieren und das Konto zu plündern.
43a Am Sonntag hat Josef mir etwas empfohlen.
43b Hat er Dir empfohlen, Marie zu verteidigen?
43c Er hat mir empfohlen, Arno zu verteidigen und die Schule zu wechseln.
44a Am Mittwoch hat Astrid mir etwas empfohlen.
44b Hat sie Dir empfohlen, Sandra zu meiden?
44c Sie hat mir empfohlen, Inga zu meiden und den Betrug zu vergessen.

Experiment I: Dialogues with novelty focus

01a Am Samstag hat Peter mir etwas versprochen.
01b Was hat er Dir denn versprochen?
01c Er hat mir versprochen, Anna zu entlasten und die Küche zu putzen.
02a Am Montag hat Rosa mir etwas versprochen.
02b Was hat sie Dir denn versprochen?
02c Sie hat mir versprochen, Helmut zu besuchen und den Konflikt zu schlichten.
03a Am Dienstag hat Achim mir etwas versprochen.
03b Was hat er Dir denn versprochen?
03c Er hat mir versprochen, Steffen zu loben und das Gehalt zu erhöhen.
04a Am Sonntag hat Dörthe mir etwas versprochen.
04b Was hat sie Dir denn versprochen?
04c Sie hat mir versprochen, Elke zu belügen und die Trennung zu vermeiden.
05a Am Freitag hat Udo mir etwas verboten.
05b Was hat er Dir denn verboten?
05c Er hat mir verboten, Jutta zu ärgern und die Eltern zu enttäuschen.
06a Am Dienstag hat Heidi mir etwas verboten.
06b Was hat sie Dir denn verboten?
06c Sie hat mir verboten, Hartmut zu verstecken und die Polizei zu rufen.
07a Was hat er Dir denn verboten?
07b Hat er Dir verboten, Sandra zu entlassen?
07c Er hat mir verboten, Ingo zu entlassen und die Firma zu gefährden.
08a Am Samstag hat Eva mir etwas verboten.
08b Was hat sie Dir denn verboten?
08c Sie hat mir verboten, Anja zu beleidigen und die Ruhe stören.
09a Am Freitag hat Rudolf mir etwas erlaubt.
09b Was hat er Dir denn erlaubt?
09c Er hat mir erlaubt, Carmen zu treffen und den Bericht zu schreiben.
10a Am Montag hat Petra mir etwas erlaubt.
10b Was hat sie Dir denn erlaubt?
10c Sie hat mir erlaubt, Markus zu fördern und das Studium zu zahlen.
11a Am Dienstag hat Konrad mir etwas erlaubt.
11b Was hat er Dir denn erlaubt?
11c Er hat mir erlaubt, Walter zu pflegen und die Grippe zu kurieren.
12a Am Mittwoch hat Sofie mir etwas erlaubt.
12b Was hat sie Dir denn erlaubt?
12c Sie hat mir erlaubt, Kerstin zu wecken und das Training zu beginnen.
13a Am Freitag hat Werner mir etwas befohlen.
13b Was hat er Dir denn befohlen?
13c Er hat mir befohlen, Lena zu suchen und den Garten zu überprüfen.
14a Am Samstag hat Sandra mir etwas befohlen.
14b Was hat sie Dir denn befohlen?
14c Sie hat mir befohlen, Günther zu ehren und den Empfang zu besuchen.
15a Am Sonntag hat Egon mir etwas befohlen.
15b Was hat er Dir denn befohlen?

15c Er hat mir befohlen, Nico zu stützen und den Notarzt zu rufen.
16a Vorgestern hat Silke mir etwas befohlen.
16b Was hat sie Dir denn befohlen?
16c Sie hat mir befohlen, Jana zu fordern und das Training zu verlängern.
17a Vorgestern hat Harald mir bei etwas geholfen.
17b Wobei hat er Dir denn geholfen?
17c Er hat mir geholfen, Sigrid zu fesseln und die Klinik zu informieren.
18a Letztes Jahr hat Marga mir bei etwas geholfen.
18b Wobei hat sie Dir denn geholfen?
18c Sie hat mir geholfen, Lukas zu führen und den Rückweg zu finden.
19a Am Mittwoch hat Johann mir bei etwas geholfen.
19b Wobei hat er Dir denn geholfen?
19c Er hat mir geholfen, Reinhard zu beruhigen und die Feier zu retten.
20a Letztes Jahr hat Lotte mir bei etwas geholfen.
20b Wobei hat sie Dir denn geholfen?
20c Sie hat mir geholfen, Magda zu trösten und die Gäste zu bewirten.
21a Vorgestern hat Simon mir etwas geschworen.
21b Was hat er Dir denn geschworen?
21c Er hat mir geschworen, Uta zu tragen und den Knöchel zu schonen.
22a Am Montag hat Vera mir etwas geschworen.
22b Was hat sie Dir denn geschworen?
22c Sie hat mir geschworen, Dietmar zu täuschen und die Akten zu vernichten.
23a Vorgestern hat Robert mir etwas geschworen.
23b Was hat er Dir denn geschworen?
23c Er hat mir geschworen, Maja zu befreien und die Frauen zu vergessen.
24a Am Dienstag hat Lisa mir etwas geschworen.
24b Was hat sie Dir denn geschworen?
24c Sie hat mir geschworen, Doris zu fangen und den Schaden zu ersetzen.
25a Am Mittwoch hat Sascha mir etwas versichert.
25b Was hat er Dir denn versichert?
25c Er hat mir versichert, Maja zu verwöhnen und den Urlaub zu bezahlen.
26a Am Freitag hat Uschi mir etwas versichert.
26b Was hat sie Dir denn versichert?
26c Sie hat mir versichert, Dietrich zu retten und die Schulden zu begleichen.
27a Am Samstag hat Gregor mir etwas versichert.
27b Was hat er Dir denn versichert?
27c Er hat mir versichert, Detlef zu finden und die Probleme zu klären.
28a Am Sonntag hat Käthe mir etwas versichert.
28b Was hat sie Dir denn versichert?
28c Sie hat mir versichert, Ingrid zu verabschieden und die Rückfahrt zu zahlen.
29a Letztes Jahr hat Eckhardt mich um etwas gebeten.
29b Um was hat er Dich denn gebeten?
29c Er hat mich gebeten, Inge zu begrüßen und den Ausflug zu unterbrechen.
30a Vorgestern hat Tina mich um etwas gebeten.
30b Um was hat sie Dich denn gebeten?
30c Sie hat mich gebeten, Phillip zu holen und den Schaden zu zeigen.
31a Vorgestern hat Werner mich um etwas gebeten.
31b Um was hat er Dich denn gebeten?
31c Er hat mich gebeten, Gerhard zu kämmen und die Frisur zu ordnen.
32a Am Montag hat Esther mich um etwas gebeten.
32b Um was hat sie Dich denn gebeten?
32c Sie hat mich gebeten, Birgit zu verfolgen und das Auto zu benutzen.
33a Am Dienstag hat Erwin mir etwas geraten.
33b Was hat er Dir denn geraten?
33c Er hat mir geraten, Stefan zu verlassen und die Chance zu nutzen.
34a Am Mittwoch hat Tanja mir etwas geraten.
34b Was hat sie Dir denn geraten?
34c Sie hat mir geraten, Rainer zu schonen und die Ärztin zu konsultieren.
35a Am Freitag hat Georg mir etwas geraten.
35b Was hat er Dir denn geraten?
35c Er hat mir geraten, Stefan zu vergessen und den Urlaub zu genießen.
36a Am Samstag hat Ella mir etwas geraten.

36b Was hat sie Dir denn geraten?
36c Sie hat mir geraten, Iris zu unterstützen und den Ärger zu vergessen.
37a Am Sonntag hat Volker mir etwas gestanden.
37b Was hat er Dir denn gestanden?
37c Er hat mir gestanden, Lore zu betrügen und die Freundin zu hintergehen.
38a Vorgestern hat Steffie mir etwas gestanden.
38b Was hat sie Dir denn gestanden?
38c Sie hat mir gestanden, Holger zu lieben und den Verstand zu verlieren.
39a Letztes Jahr hat Armin mir etwas gestanden.
39b Was hat er Dir denn gestanden?
39c Er hat mir gestanden, Norbert zu kennen und die Freundschaft zu schätzen.
40a Vorgestern hat Christa mir etwas gestanden.
40b Was hat sie Dir denn gestanden?
40c Sie hat mir gestanden, Hanna zu fürchten und den Verstand zu verlieren.
41a Am Montag hat Henning mir etwas empfohlen.
41b Was hat er Dir denn empfohlen?
41c Er hat mir empfohlen, Moni zu schützen und den Anwalt einzuschalten.
42a Letztes Jahr hat Ines mir etwas empfohlen.
42b Was hat sie Dir denn empfohlen?
42c Sie hat mir empfohlen, Jochen zu ruinieren und das Konto zu plündern.
43a Am Sonntag hat Josef mir etwas empfohlen.
43b Was hat er Dir denn empfohlen?
43c Er hat mir empfohlen, Arno zu verteidigen und die Schule zu wechseln.
44a Am Mittwoch hat Astrid mir etwas empfohlen.
44b Was hat sie Dir denn empfohlen?
44c Sie hat mir empfohlen, Inga zu meiden und den Betrug zu vergessen.

Experiment II: Dialogues with correction focus and adjunct insertion

01a Für Samstag hat Peter mir etwas versprochen.
01b Hat er Dir versprochen, Frauke am Samstag zu entlasten?
01c Er hat mir versprochen, Anna am Samstag zu entlasten und die Küche zu putzen.
02a Für Montag hat Rosa mir etwas versprochen.
02b Hat sie Dir versprochen, Karsten am Montag zu besuchen?
02c Sie hat mir versprochen, Helmut am Montag zu besuchen und den Konflikt zu schlichten.
03a Für Dienstag hat Achim mir etwas versprochen.
03b Hat er Dir versprochen, Lisa am Dienstag zu loben?
03c Er hat mir versprochen, Steffen am Dienstag zu loben und das Gehalt zu erhöhen.
04a Für Sonntag hat Dörthe mir etwas versprochen.
04b Hat sie Dir versprochen, Nora am Sonntag zu belügen?
04c Sie hat mir versprochen, Elke am Sonntag zu belügen und die Trennung zu vermeiden.
05a Für Freitag hat Udo mir etwas verboten.
05b Hat er Dir verboten, Jürgen am Freitag zu ärgern?
05c Er hat mir verboten, Jutta am Freitag zu ärgern und die Eltern zu enttäuschen.
06a Für Mittwoch hat Heidi mir etwas verboten.
06b Hat sie dir verboten, Karin am Mittwoch zu verstecken
06c Sie hat mir verboten, Hartmut am Mittwoch zu verstecken und die Polizei zu rufen.
07a Für den Juni hat Arthur mir etwas verboten.
07b Hat er Dir verboten, Sandra im Juli zu entlassen?
07c Er hat mir verboten, Ingo im Juni zu entlassen und die Firma zu gefährden.
08a Für Samstag hat Eva mir etwas verboten.
08b Hat sie Dir verboten, Holger am Samstag zu beleidigen?
08c Sie hat mir verboten, Anja am Samstag zu beleidigen und die Ruhe stören.
09a Für Freitag hat Rudolf mir etwas erlaubt.
09b Hat er Dir erlaubt, Martin am Freitag zu treffen?
09c Er hat mir erlaubt, Carmen am Freitag zu treffen und den Bericht zu schreiben.
10a Für den Juli hat Petra mir etwas erlaubt.
10b Hat sie Dir erlaubt, Helga im Juli zu fördern?
10c Sie hat mir erlaubt, Markus im Juli zu fördern und das Studium zu zahlen.
11a Für den Abend hat Konrad mir etwas erlaubt.
11b Hat er Dir erlaubt, Manja am Abend zu pflegen?
11c Er hat mir erlaubt, Walter am Abend zu pflegen und die Suppe zu kochen.
12a Für den Morgen hat Sofie mir etwas erlaubt.

12b Hat sie Dir erlaubt, Lukas am Morgen zu wecken?
12c Sie hat mir erlaubt, Kerstin am Morgen zu wecken und das Training zu beginnen.
13a Für den Abend hat Werner mir etwas befohlen.
13b Hat er Dir befohlen, Lore am Abend zu suchen?
13c Er hat mir befohlen, Lena am Abend zu suchen und den Garten zu überprüfen.
14a Für den Juli hat Sandra mir etwas befohlen.
14b Hat sie Dir befohlen, Nina im Juli zu ehren?
14c Sie hat mir befohlen, Günther im Juli zu ehren und den Empfang zu besuchen.
15a Für den Morgen hat Egon mir etwas befohlen.
15b Hat er Dir befohlen, Franka am Morgen zu stützen?
15c Er hat mir befohlen, Nico am Morgen zu stützen und den Notarzt zu rufen.
16a Für den Juni hat Silke mir etwas befohlen.
16b Hat sie Dir befohlen, Achim im Juni zu fordern?
16c Sie hat mir befohlen, Jana im Juni zu fordern und das Training zu verlängern.
17a Am Mittag hat Harald mir bei etwas geholfen.
17b Hat er Dir geholfen, Maja am Mittag zu fesseln?
17c Er hat mir geholfen, Sigrid am Mittag zu fesseln und die Klinik zu informieren.
18a Am Morgen hat Marga mir bei etwas geholfen.
18b Hat sie Dir geholfen, Thomas am Morgen zu führen?
18c Sie hat mir geholfen, Lukas am Morgen zu führen und den Rückweg zu finden.
19a Am Mittwoch hat Johann mir bei etwas geholfen.
19b Hat er Dir geholfen, Anke am Mittwoch zu beruhigen?
19c Er hat mir geholfen, Reinhard am Mittwoch zu beruhigen und die Feier zu retten.
20a Im Juni hat Lotte mir bei etwas geholfen.
20b Hat sie Dir geholfen, Heinrich im Juni zu trösten?
20c Sie hat mir geholfen, Magda im Juni zu trösten und die Gäste zu bewirten.
21a Für den Morgen hat Simon mir etwas geschworen.
21b Hat er Dir geschworen, Magda am Morgen zu tragen?
21c Er hat mir geschworen, Uta am Morgen zu tragen und den Knöchel zu schonen.
22a Für Montag hat Vera mir etwas geschworen.
22b Hat sie Dir geschworen, Simon am Montag zu täuschen?
22c Sie hat mir geschworen, Dietmar am Montag zu täuschen und die Akten zu vernichten.
23a Für den Mittag hat Robert mir etwas geschworen.
23b Hat er Dir geschworen, Nadja am Mittag zu befreien?
23c Er hat mir geschworen, Maja am Mittag zu befreien und die Frauen zu vergessen.
24a Für Dienstag hat Lisa mir etwas geschworen.
24b Hat sie Dir geschworen, Suse am Dienstag zu fangen?
24c Sie hat mir geschworen, Doris am Dienstag zu fangen und den Schaden zu ersetzen.
25a Für Mittwoch hat Sascha mir etwas versichert.
25b Hat er Dir versichert, Hendrik am Mittwoch zu verwöhnen?
25c Er hat mir versichert, Maja am Mittwoch zu verwöhnen und den Urlaub zu bezahlen.
26a Für Freitag hat Uschi mir etwas versichert.
26b Hat sie Dir versichert, Moritz am Freitag zu retten?
26c Sie hat mir versichert, Dietrich am Freitag zu retten und die Schulden zu begleichen.
27a Für Samstag hat Gregor mir etwas versichert.
27b Hat er Dir versichert, Anja am Samstag zu finden?
27c Er hat mir versichert, Detlef am Samstag zu finden und die Probleme zu klären.
28a Für Sonntag hat Käthe mir etwas versichert.
28b Hat sie Dir versichert, Rene am Sonntag zu begleiten?
28c Sie hat mir versichert, Ingrid am Sonntag zu begleiten und die Umgebung zu zeigen.
29a Für den Juli hat Eckhardt mich um etwas gebeten.
29b Hat er Dich gebeten, Lore im Juli zu begrüßen?
29c Er hat mich gebeten, Inge im Juli zu begrüßen und den Ausflug zu unterbrechen.
30a Für den Abend hat Tina mich um etwas gebeten.
30b Hat sie Dich gebeten, Jonas am Abend zu holen?
30c Sie hat mich gebeten, Phillip am Abend zu holen und den Schaden zu zeigen.
31a Für Freitag hat Werner mich um etwas gebeten.
31b Hat er Dich gebeten, Karla am Freitag zu vertrösten?
31c Er hat mich gebeten, Gerhard am Freitag zu vertrösten und die Geduld zu bewahren.
32a Für Montag hat Esther mich um etwas gebeten.
32b Hat sie Dich gebeten, Otto am Montag zu verfolgen?
32c Sie hat mich gebeten, Birgit am Montag zu verfolgen und das Auto zu benutzen.

33a Für Dienstag hat Erwin mir etwas geraten.
33b Hat er Dir geraten, Martin am Dienstag zu verlassen?
33c Er hat mir geraten, Stefan am Dienstag zu verlassen und die Chance zu nutzen. .
34a Für den Abend hat Tanja mir etwas geraten.
34b Hat sie Dir geraten, Stefan am Abend zu schonen?
34c Sie hat mir geraten, Rainer am Abend zu schonen und die Ärztin zu konsultieren.
35a Für den Juli hat Georg mir etwas geraten.
35b Hat er Dir geraten, Karsten im Juli zu vergessen?
35c Er hat mir geraten, Stefan im Juli zu vergessen und den Urlaub zu genießen.
36a Für Samstag hat Ella mir etwas geraten.
36b Hat sie Dir geraten, Kerstin am Samstag zu unterstützen?
36c Sie hat mir geraten, Iris am Samstag zu unterstützen und den Ärger zu vergessen.
37a Vor dem Urlaub hat Volker mir etwas gestanden.
37b Hat er Dir gestanden, Steffie im Urlaub zu betrügen?
37c Er hat mir gestanden, Lore im Urlaub zu betrügen und die Freundin zu hintergehen.
38a Über den Juli hat Steffie mir etwas gestanden.
38b Hat sie Dir gestanden, Peter seit Juli zu lieben?
38c Sie hat mir gestanden, Holger seit Juli zu lieben und den Verstand zu verlieren.
39a Über den Juni hat Armin mir etwas gestanden.
39b Hat er Dir gestanden, Petra seit Juni zu kennen?
39c Er hat mir gestanden, Norbert seit Juni zu kennen und die Freundschaft zu schätzen.
40a Nach Freitag hat Christa mir etwas gestanden.
40b Hat sie Dir gestanden, Simon seit Freitag zu fürchten?
40c Sie hat mir gestanden, Hanna seit Freitag zu fürchten und die Wohnung zu verschließen.
41a Für Montag hat Henning mir etwas empfohlen.
41b Hat er Dir empfohlen, Ines am Montag zu schützen?
41c Er hat mir empfohlen, Moni am Montag zu schützen und den Anwalt einzuschalten.
42a Für den Urlaub hat Ines mir etwas empfohlen.
42b Hat sie Dir empfohlen, Markus im Urlaub zu ruinieren?
42c Sie hat mir empfohlen, Jochen im Urlaub zu ruinieren und das Konto zu plündern.
43a Für Sonntag hat Josef mir etwas empfohlen.
43b Hat er Dir empfohlen, Marie am Sonntag zu verteidigen?
43c Er hat mir empfohlen, Arno am Sonntag zu verteidigen und die Schule zu wechseln.
44a Für den Mittag hat Astrid mir etwas empfohlen.
44b Hat sie Dir empfohlen, Sandra am Mittag zu meiden?
44c Sie hat mir empfohlen, Inga am Mittag zu meiden und den Betrug zu vergessen.

Experiment II: Dialogues with novelty focus and adjunct insertion

01a Für Samstag hat Peter mir etwas versprochen.
01b Was hat er Dir denn für Samstag versprochen?
01c Er hat mir versprochen, Anna am Samstag zu entlasten und die Küche zu putzen.
02a Für Montag hat Rosa mir etwas versprochen.
02b Was hat sie Dir denn für Montag versprochen?
02c Sie hat mir versprochen, Helmut am Montag zu besuchen und den Konflikt zu schlichten.
03a Für Dienstag hat Achim mir etwas versprochen.
03b Was hat er Dir denn für Dienstag versprochen?
03c Er hat mir versprochen, Steffen am Dienstag zu loben und das Gehalt zu erhöhen.
04a Für Sonntag hat Dörthe mir etwas versprochen.
04b Was hat sie Dir denn für Sonntag versprochen?
04c Sie hat mir versprochen, Elke am Sonntag zu belügen und die Trennung zu vermeiden.
05a Für Freitag hat Udo mir etwas verboten.
05b Was hat er Dir denn für Freitag verboten?
05c Er hat mir verboten, Jutta am Freitag zu ärgern und die Eltern zu enttäuschen.
06a Für Mittwoch hat Heidi mir etwas verboten.
06b Was hat sie Dir denn für Mittwoch verboten?
06c Sie hat mir verboten, Hartmut am Mittwoch zu verstecken und die Polizei zu rufen.
07a Für den Juni hat Arthur mir etwas verboten.
07b Was hat er Dir denn für den Juni verboten?
07c Er hat mir verboten, Ingo im Juni zu entlassen und die Firma zu gefährden.
08a Für Samstag hat Eva mir etwas verboten.
08b Was hat sie Dir denn für Samstag verboten?
08c Sie hat mir verboten, Anja am Samstag zu beleidigen und die Ruhe stören.

09a Für Freitag hat Rudolf mir etwas erlaubt.
09b Was hat er Dir denn für Freitag erlaubt?
09c Er hat mir erlaubt, Carmen am Freitag zu treffen und den Bericht zu schreiben.
10a Für den Juli hat Petra mir etwas erlaubt.
10b Was hat sie Dir denn für den Juli erlaubt?
10c Sie hat mir erlaubt, Markus im Juli zu fördern und das Studium zu zahlen.
11a Für den Abend hat Konrad mir etwas erlaubt.
11b Was hat er Dir denn für den Abend erlaubt?
11c Er hat mir erlaubt, Walter am Abend zu pflegen und die Suppe zu kochen.
12a Für den Morgen hat Sofie mir etwas erlaubt.
12b Was hat sie Dir denn für den Morgen erlaubt?
12c Sie hat mir erlaubt, Kerstin am Morgen zu wecken und das Training zu beginnen.
13a Für den Abend hat Werner mir etwas befohlen.
13b Was hat er Dir denn für den Abend befohlen?
13c Er hat mir befohlen, Lena am Abend zu suchen und den Garten zu überprüfen.
14a Für den Juli hat Sandra mir etwas befohlen.
14b Was hat sie Dir denn für den Juli befohlen?
14c Sie hat mir befohlen, Günther im Juli zu ehren und den Empfang zu besuchen.
15a Für den Morgen hat Egon mir etwas befohlen.
15b Was hat er Dir denn für den Morgen befohlen?
15c Er hat mir befohlen, Nico am Morgen zu stützen und den Notarzt zu rufen.
16a Für den Juni hat Silke mir etwas befohlen.
16b Was hat sie Dir denn für den Juni befohlen?
16c Sie hat mir befohlen, Jana im Juni zu fordern und das Training zu verlängern.
17a Am Mittag hat Harald mir bei etwas geholfen.
17b Wobei hat er Dir denn am Mittag geholfen?
17c Er hat mir geholfen, Sigrid am Mittag zu fesseln und die Klinik zu informieren.
18a Am Morgen hat Marga mir bei etwas geholfen.
18b Wobei hat sie Dir denn am Morgen geholfen?
18c Sie hat mir geholfen, Lukas am Morgen zu führen und den Rückweg zu finden.
19a Am Mittwoch hat Johann mir bei etwas geholfen.
19b Wobei hat er Dir denn am Mittwoch geholfen?
19c Er hat mir geholfen, Reinhard am Mittwoch zu beruhigen und die Feier zu retten.
20a Im Juni hat Lotte mir bei etwas geholfen.
20b Wobei hat sie Dir denn im Juni geholfen?
20c Sie hat mir geholfen, Magda im Juni zu trösten und die Gäste zu bewirten.
21a Für den Morgen hat Simon mir etwas geschworen.
21b Was hat er Dir denn für den Morgen geschworen?
21c Er hat mir geschworen, Uta am Morgen zu tragen und den Knöchel zu schonen.
22a Für Montag hat Vera mir etwas geschworen.
22b Was hat sie Dir denn für Montag geschworen?
22c Sie hat mir geschworen, Dietmar am Montag zu täuschen und die Akten zu vernichten.
23a Für den Mittag hat Robert mir etwas geschworen.
23b Was hat er Dir denn für den Mittag geschworen?
23c Er hat mir geschworen, Maja am Mittag zu befreien und die Frauen zu vergessen.
24a Für Dienstag hat Lisa mir etwas geschworen.
24b Was hat sie Dir denn für Dienstag geschworen?
24c Sie hat mir geschworen, Doris am Dienstag zu fangen und den Schaden zu ersetzen.
25a Für Mittwoch hat Sascha mir etwas versichert.
25b Was hat er Dir denn für Mittwoch versichert?
25c Er hat mir versichert, Maja am Mittwoch zu verwöhnen und den Urlaub zu bezahlen.
26a Für Freitag hat Uschi mir etwas versichert.
26b Was hat sie Dir denn für Freitag versichert?
26c Sie hat mir versichert, Dietrich am Freitag zu retten und die Schulden zu begleichen.
27a Für Samstag hat Gregor mir etwas versichert.
27b Was hat er Dir denn für Samstag versichert?
27c Er hat mir versichert, Detlef am Samstag zu finden und die Probleme zu klären.
28a Für Sonntag hat Käthe mir etwas versichert.
28b Was hat sie Dir denn für Sonntag versichert?
28c Sie hat mir versichert, Ingrid am Sonntag zu begleiten und die Umgebung zu zeigen.
29a Für den Juli hat Eckhardt mich um etwas gebeten.
29b Um was hat er Dich denn für den Juli gebeten?

29c Er hat mich gebeten, Inge im Juli zu begrüßen und den Ausflug zu unterbrechen.
30a Für den Abend hat Tina mich um etwas gebeten.
30b Um was hat sie Dich denn für den Abend gebeten?
30c Sie hat mich gebeten, Phillip am Abend zu holen und den Schaden zu zeigen.
31a Für Freitag hat Werner mich um etwas gebeten.
31b Um was hat er Dich denn für Freitag gebeten?
31c Er hat mich gebeten, Gerhard am Freitag zu vertrösten und die Geduld zu bewahren.
32a Für Montag hat Esther mich um etwas gebeten.
32b Um was hat sie Dich denn für Montag gebeten?
32c Sie hat mich gebeten, Birgit am Montag zu verfolgen und das Auto zu benutzen.
33a Für Dienstag hat Erwin mir etwas geraten.
33b Was hat er Dir denn für Dienstag geraten?
33c Er hat mir geraten, Stefan am Dienstag zu verlassen und die Chance zu nutzen. .
34a Für den Abend hat Tanja mir etwas geraten.
34b Was hat sie Dir denn für den Abend geraten?
34c Sie hat mir geraten, Rainer am Abend zu schonen und die Ärztin zu konsultieren.
35a Für den Juli hat Georg mir etwas geraten.
35b Was hat er Dir denn für den Juli geraten?
35c Er hat mir geraten, Stefan im Juli zu vergessen und den Urlaub zu genießen.
36a Für Samstag hat Ella mir etwas geraten.
36b Was hat sie Dir denn für Samstag geraten?
36c Sie hat mir geraten, Iris am Samstag zu unterstützen und den Ärger zu vergessen.
37a Vor dem Urlaub hat Volker mir etwas gestanden.
37b Was hat er Dir denn vor dem Urlaub gestanden?
37c Er hat mir gestanden, Lore im Urlaub zu betrügen und die Freundin zu hintergehen.
38a Über den Juli hat Steffie mir etwas gestanden.
38b Was hat sie Dir denn über den Juli gestanden?
38c Sie hat mir gestanden, Holger seit Juli zu lieben und den Verstand zu verlieren.
39a Über den Juni hat Armin mir etwas gestanden.
39b Was hat er Dir denn über den Juni gestanden?
39c Er hat mir gestanden, Norbert seit Juni zu kennen und die Freundschaft zu schätzen.
40a Nach Freitag hat Christa mir etwas gestanden.
40b Was hat sie Dir denn nach Freitag gestanden?
40c Sie hat mir gestanden, Hanna seit Freitag zu fürchten und die Wohnung zu verschließen.
41a Für Montag hat Henning mir etwas empfohlen.
41b Was hat er Dir denn für Montag empfohlen?
41c Er hat mir empfohlen, Moni am Montag zu schützen und den Anwalt einzuschalten.
42a Für den Urlaub hat Ines mir etwas empfohlen.
42b Was hat sie Dir denn für den Urlaub empfohlen?
42c Sie hat mir empfohlen, Jochen im Urlaub zu ruinieren und das Konto zu plündern.
43a Für Sonntag hat Josef mir etwas empfohlen.
43b Was hat er Dir denn für Sonntag empfohlen?
43c Er hat mir empfohlen, Arno am Sonntag zu verteidigen und die Schule zu wechseln.
44a Für den Mittag hat Astrid mir etwas empfohlen.
44b Was hat sie Dir denn für den Mittag empfohlen?
44c Sie hat mir empfohlen, Inga am Mittag zu meiden und den Betrug zu vergessen.

Experiment III: Dialogues with i-topics

01a Am Samstag hat Peter mir etwas versprochen.
01b Hat er Dir versprochen, Deine Freunde zu beanspruchen?
01c Er hat mir versprochen, Anna zu entlasten und Claudia zu befreien.
02a Am Montag hat Rosa mir etwas versprochen.
02b Hat sie Dir versprochen, Deine Kumpel einzuladen?
02c Sie hat mir versprochen, Helmut zu besuchen und Marius auszuladen.
03a Am Dienstag hat Achim mir etwas versprochen.
03b Hat er Dir versprochen, Deine Schüler zu tadeln?
03c Er hat mir versprochen, Steffen zu loben und Sabrina zu achten.
04a Am Sonntag hat Dörthe mir etwas versprochen.
04b Hat sie Dir versprochen, Deinen Tanten die Wahrheit zu sagen?
04c Sie hat mir versprochen, Elke zu belügen und Ilona zu meiden.
05a Am Freitag hat Udo mir etwas verboten.
05b Hat er Dir verboten, Deine Schwägerinnen zu erfreuen?

05c Er hat mir verboten, Jutta zu ärgern und Simone zu enttäuschen.
06a Am Dienstag hat Heidi mir etwas verboten.
06b Hat sie Dir verboten, Deine Cousins aufzuspüren?
06c Sie hat mir verboten, Hartmut zu verstecken und Nikolai zu tarnen.
07a Was hat er Dir denn verboten?
07b Hat er Dir verboten, Deine Kollegen zu beschäftigen?
07c Er hat mir verboten, Ingo zu entlassen und Florian raus zu werfen.
08a Am Samstag hat Eva mir etwas verboten.
08b Hat sie Dir verboten, Deine Freundinnen zu ehren?
08c Sie hat mir verboten, Anja zu beleidigen und Karina zu kränken.
09a Am Freitag hat Rudolf mir etwas erlaubt.
09b Hat er Dir erlaubt, Deine Bekannten zu ignorieren?
09c Er hat mir erlaubt, Carmen zu treffen und Stefanie zu sprechen.
10a Am Montag hat Petra mir etwas erlaubt.
10b Hat sie Dir erlaubt, Deine Brüder zu behindern?
10c Sie hat mir erlaubt, Markus zu fördern und Michael zu begünstigen.
11a Am Dienstag hat Konrad mir etwas erlaubt.
11b Hat er Dir erlaubt, Deine Opas zu vernachlässigen?
11c Er hat mir erlaubt, Walter zu pflegen und Theodor zu besuchen.
12a Am Mittwoch hat Sofie mir etwas erlaubt.
12b Hat sie Dir erlaubt, Deine Nichten schlafen zu lassen?
12c Sie hat mir erlaubt, Kerstin zu wecken und Tamara zu stören.
13a Am Freitag hat Werner mir etwas befohlen.
13b Hat er Dir befohlen, Deine Kinder zu verstecken?
13c Er hat mir befohlen, Lena zu suchen und Benjamin zu finden.
14a Am Samstag hat Sandra mir etwas befohlen.
14b Hat sie Dir befohlen, Deine Verehrer zu missachten?
14c Sie hat mir befohlen, Günther zu ehren und Waldemar zu umwerben.
15a Am Sonntag hat Egon mir etwas befohlen.
15b Hat er Dir befohlen, Deine Rivalen zu stürzen?
15c Er hat mir befohlen, Nico zu stützen und Christian aufzufangen.
16a Vorgestern hat Silke mir etwas befohlen.
16b Hat sie Dir befohlen, Deine Schüler zu schonen?
16c Sie hat mir befohlen, Jana zu fordern und Beate zu trainieren.
17a Vorgestern hat Harald mir bei etwas geholfen.
17b Hat er Dir geholfen, Deine Widersacher zu befreien?
17c Er hat mir geholfen, Sigrid zu fesseln und Monika zu knebeln.
18a Letztes Jahr hat Marga mir bei etwas geholfen.
18b Hat sie Dir geholfen, Deine Jungen zu verwirren?
18c Sie hat mir geholfen, Lukas zu führen und Benedikt zu finden.
19a Am Mittwoch hat Johann mir bei etwas geholfen.
19b Hat er Dir geholfen, Deine Onkel aufzuregen?
19c Er hat mir geholfen, Reinhard zu beruhigen und Christopher zu bändigen.
20a Letztes Jahr hat Lotte mir bei etwas geholfen.
20b Hat sie Dir geholfen, Deine Besucher zu ärgern?
20c Sie hat mir geholfen, Magda zu trösten und Sybille zu bemitleiden.
21a Vorgestern hat Simon mir etwas geschworen.
21b Hat er Dir geschworen, Deine Cousinen liegen zu lassen?
21c Er hat mir geschworen, Uta zu tragen und Barbara zu schonen.
22a Am Montag hat Vera mir etwas geschworen.
22b Hat sie Dir geschworen, Deine Kollegen anzuzeigen?
22c Sie hat mir geschworen, Dietmar zu täuschen und Johannes zu vernichten.
23a Vorgestern hat Robert mir etwas geschworen.
23b Hat er Dir geschworen, Deine Freundinnen zu erobern?
23c Er hat mir geschworen, Maja zu befreien und Sabine zu retten.
24a Am Dienstag hat Lisa mir etwas geschworen.
24b Hat sie Dir geschworen, Deine Feinde zu befreien?
24c Sie hat mir geschworen, Doris zu fangen und Tobias zu ergreifen.
25a Am Mittwoch hat Sascha mir etwas versichert.
25b Hat er Dir versichert, Deine Schüler abzuhärten?
25c Er hat mir versichert, Maja zu verwöhnen und Nikola zu akzeptieren.
26a Am Freitag hat Uschi mir etwas versichert.

26b Hat sie Dir versichert, Deine Schützlinge zu vernichten?
26c Sie hat mir versichert, Dietrich zu retten und Leopold zu sichern.
27a Am Samstag hat Gregor mir etwas versichert.
27b Was hat er Dir denn versichert?
27c Er hat mir versichert, Detlef zu finden und Rüdiger zu treffen.
28a Am Sonntag hat Käthe mir etwas versichert.
28b Hat sie Dir versichert, Deine Omas zu begrüßen?
28c Sie hat mir versichert, Ingrid zu verabschieden und Maria zu entlassen.
29a Letztes Jahr hat Eckhardt mich um etwas gebeten.
29b Hat er Dich gebeten, Deine Mitarbeiter zu verabschieden?
29c Er hat mich gebeten, Inge zu begrüßen und Daniel zu empfangen.
30a Vorgestern hat Tina mich um etwas gebeten.
30b Hat sie Dich gebeten, Deine Mieter wegzuschicken?
30c Sie hat mich gebeten, Phillip zu holen und Matthias zu rügen.
31a Vorgestern hat Werner mich um etwas gebeten.
31b Hat er Dich gebeten, Deine Lieblinge zu zausen?
31c Er hat mich gebeten, Gerhard zu kämmen und Valentin zu fönen.
32a Am Montag hat Esther mich um etwas gebeten.
32b Hat sie Dich gebeten, Deine Gäste flüchten zu lassen?
32c Sie hat mich gebeten, Birgit zu verfolgen und Karolin zu jagen.
33a Am Dienstag hat Erwin mir etwas geraten.
33b Hat er Dir geraten, Deine Geliebten zu halten?
33c Er hat mir geraten, Stefan zu verlassen und Michael zu wählen.
34a Am Mittwoch hat Tanja mir etwas geraten.
34b Hat sie Dir geraten, Deine Mitkämpfer zu fordern?
34c Sie hat mir geraten, Rainer zu schonen und Leonard zu behüten.
35a Am Freitag hat Georg mir etwas geraten.
35b Hat er Dir geraten, Deine Bekannten zu treffen?
35c Er hat mir geraten, Stefan zu vergessen und Gabriel zu prüfen.
36a Am Samstag hat Ella mir etwas geraten.
36b Hat sie Dir geraten, Deine Kolleginnen zu bekämpfen?
36c Sie hat mir geraten, Iris zu unterstützen und Karola zu fördern.
37a Am Sonntag hat Volker mir etwas gestanden.
37b Hat er Dir gestanden, Deine Nachbarn zu lieben?
37c Er hat mir gestanden, Lore zu betrügen und Ricarda zu hintergehen.
38a Vorgestern hat Steffie mir etwas gestanden.
38b Hat sie Dir gestanden, Deine Kavaliere zu hassen?
38c Sie hat mir gestanden, Holger zu lieben und Frederik zu achten.
39a Letztes Jahr hat Armin mir etwas gestanden.
39b Hat er Dir gestanden, Deine Gegner zu verleugnen?
39c Er hat mir gestanden, Norbert zu kennen und Konstantin zu schätzen.
40a Vorgestern hat Christa mir etwas gestanden.
40b Hat sie Dir gestanden, Deine Gäste zu verehren?
40c Sie hat mir gestanden, Hanna zu fürchten und Evelin zu belauschen.
41a Am Montag hat Henning mir etwas empfohlen.
41b Hat er Dir empfohlen, Deine Mädchen auszuliefern?
41c Er hat mir empfohlen, Moni zu schützen und Annette zu behüten.
42a Letztes Jahr hat Ines mir etwas empfohlen.
42b Hat sie Dir empfohlen, Deine Chefs zu fördern?
42c Sie hat mir empfohlen, Jochen zu ruinieren und Daniel zu verraten.
43a Am Sonntag hat Josef mir etwas empfohlen.
43b Hat er Dir empfohlen, Deine Partner anzugreifen?
43c Er hat mir empfohlen, Arno zu verteidigen und Sylvia zu bewundern.
44a Am Mittwoch hat Astrid mir etwas empfohlen.
44b Hat sie Dir empfohlen, Deine Vertrauten zu suchen?
44c Sie hat mir empfohlen, Inga zu meiden und Angela zu vergessen.

Curriculum vitae

Name	Ulrike Toepel
Date of birth	29 June 1973
Since 11/2004	Research assistant at the Max Planck Institute for Cognitive and Brain Sciences, Leipzig, Germany
2001 – 10/2004	PhD student at the Max Planck Institute for Cognitive and Brain Sciences
1996 – 2001	Studies in Clinical Linguistics at the University of Potsdam Diplom (the German masters) in Clinical Linguistics
1994 – 1996	Evening Senior High School, Halle (university-entrance diploma)
1993 – 1994	Au pair and farm worker in Edenderry, Ireland
1990 – 1993	Vocational training as a paediatric nurse in Bernburg, Germany
1988 – 1990	Senior High School “August Hermann Francke”, Halle, Germany
1980 – 1988	Elementary and Junior High School , Koennern, Germany

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