Phonetic Correlates of Second Occurrence Focus*

Shinichiro Ishihara and Caroline Féry

University of Potsdam

1. Introduction

In this paper, we investigate the question whether and how 'second occurrence focus' (SOF) is realized phonetically in German. The phonetic realization of SOF is related to the question of the interface between LF and PF in grammar. In the previous experimental work on SOF (Rooth 1996, Bartels 2004, Beaver et al. 2004), the researchers only examined the SOF expressions in a postnuclear location. In our experiment, we examined SOF expressions not only in a postnuclear position, but also in a prenuclear position, where accents are realized with an increase in pitch, and show that SOF is in fact phonetically realized by a pitch accent in a prenuclear context.

After an overview of the theoretical issues of SOF and a presentation of problems for the model of grammar in the next section, experimental methods and results are discussed in sections 3 and 4, respectively. The paper ends with a conclusion in section 5.

2. Theoretical Background

The phenomenon of second occurrence focus (SOF) was first described by Partee (1999:215−216) in the following terms:

> If *only* is a focus sensitive operator (i.e., needs an intonationally prominent element in its scope) then the two occurrences of *only eats vegetables* in [(1)] should have the same analysis. However, if there is no phonological reflex of focus in the second occurrence of *vegetables* then this leads to

*We would like to acknowledge the audience at NELS36. Some parts of this paper were also presented at P&P2 in Tubingen, SFB632 Internal Workshop, and the 23rd ELSJ Conference in Fukuoka. We would also like to thank the following people for their comments and discussion: David Beaver, Daniel Büring, Gisbert Fanselow, Ingo Feldhausen, Manfred Krifka, Frank Kügler, and Shravan Vasishth. Many thanks also go to Felix Engelmann, Elisabeth Fleischhauer, Susanne Gensel, Kristin Irsig and Esther Sommerfeld for their help with the data analysis, and to Elizabeth Medvedovsky for English correction. All the remaining errors are ours. This study is part of the SFB632 "Information Structure" funded by the DFG.

> the notion of "phonologically invisible focus." The notion of inaudible foci "at best would force the recognition of a multiplicity of different notions of 'focus' and at worst might lead to a fundamentally incoherent notion of focus.

(1) a. Everyone already knew that Mary only eats [vegetables]$_F$
b. If even [Paul]$_F$ knew that Mary only eats [vegetables]$_{SOF}$, then he should have suggested a different restaurant.

Partee indirectly assumes an obligatory phonetic realization of focus. If there are foci without accents, no coherent notion of focus can be obtained. As Krifka (2004:190) puts it (his Hypothesis I): "If an operator is analyzed as focus-sensitive (i.e., associated with a focus) in one type of use, it must be analyzed as focus-sensitive (associated with a focus) in all types of use." Association with focus, an expression coined by Jackendoff (1972), means explicitly that certain expressions have a focus in their syntactic domain, where focus is specified by a syntactic feature F, which in turn is realized by intonational prominence. The conclusion one has to draw from Partee's comment is that if there is no phonological correlate on a SOF, then there is also no focus.

Following Rooth (1992, 1999), researchers such as Beaver et al. (2004), Bartels (2004), von Fintel (2004), and Krifka (2004) distinguish (though not necessarily with the same terminology) between two types of semantic theories of focus. The 'weak' theory (Rooth 1992, 1999) requires both a focus-marking F and a phonological (and phonetic) realization of focus. In the 'strong' theory, on the other hand, resolution of focus is pragmatic, and hence, the relationship between focus and grammar functions in a more lax manner. In the latter view, the quantificational domains of some operators may be restricted contextually or situationally. This model predicts that focus can be left phonetically unrealized, since focus does not need to be grammatically marked. All the authors assume that the phonetic realization of focus is crucial for deciding between the semantic theories. Krifka (2004) takes for granted Partee's claim that SOF is 'inaudible', but other authors, like Rooth (1996), Bartels (2004) and Beaver et al. (2004) answer Partee's challenge by proving that SOF is phonetically realized.

Rooth, Bartels and Beaver et al. have conducted experiments to investigate whether SOF expressions are realized phonetically. (2) and (3) are examples of the experimental material used by Beaver et al. to show the phonetic realization of SOF.

(2) a. Both Sid and his accomplices should have been named in this morning's court session.
b. But the defendant only named [Sid]$_F$ in court today.
c. Even [the state prosecutor]$_F$ only named [Sid]$_{SOF}$ in court today.

(3) a. Defense and Prosecution had agreed to implicate Sid both in court and on television.
b. Still, the defense attorney only named Sid [in court]$_F$ today.
c. Even [the state prosecutor]$_F$ only named Sid [in court]$_{SOF}$ today.

In the examples above, the areas of interest are both the first and the second postverbal phrases (NP *Sid* and PP *in court*) of the last sentence in a discourse. The (a) sentence first introduces a context in which both phrases are new. Then the (b) sentence introduces a context in which one of the phrases is a first occurrence focus (FOF)—*Sid* in (2), and *in court* in (3)—and the other one is in the background. In (c), the FOF in (b) is now SOF and the other phrase is still part of the background. The SOF effect is obtained by realizing a new focus in (c) (*the state prosecutor*) with a nuclear pitch accent, and by simply repeating the postverbal phrases. But, since one of them is still in the restrictor of the 'old' focus operator *only*, it remains focused. The phonetic realization of this focus, however, is much more subtle than that of FOF in the (b) examples, and hence, raises the question formulated by Partee. The researchers mentioned above all find some phonetic correlates of focus, though no pitch accent.

In an utterance like (2c), repeated as (4B), the SOF *Sid* is a focus by virtue of being associated with a focus operator, but crucially, it is embedded in a larger expression which is itself in the background, or discourse-given, which is usually realized in a lower pitch than discourse-new material (cf. Sugahara 2003). The SOF results from the conflict of being focused and being given. The question which all experiments on SOF have explicitly or implicitly attempted to answer, is whether the focus realization is completely overridden by pitch-lowering due to givenness or whether some phonetic correlates of focus remain.

(4) A: But the defendant only named $[\text{Sid}]_{\text{F}}$ in court today.
B: $[\text{Even } [\text{the state prosecutor}]_{\text{FOF}}]_{\text{Focus}} [\text{only named } [\text{Sid}]_{\text{SOF}} \text{ in court today}]_{\text{Given}}$

Rooth (1996), Bartels (2004) and Beaver et al (2004) find no or only a very slight increase in pitch on the SOF as compared to the counterparts in the minimal pair examples. They find instead other phonetic correlates, like a small increase in duration (an average of 6ms in Beaver et al.), and a very slight (non-significant in Beaver et al.) increase in intensity and in the F_0-range in the second occurrence focus condition as compared to the same word in a non-focused position. On the basis of these results, all the authors conclude that the prominence on SOF is different from a plain pitch accent. Rooth calls it a 'metrical accent', and Beaver et al. a 'phrasal stress', which they say formally differs from pitch accent. According to them, focus is marked both by phrasal stress and a nuclear pitch accent, whereas SOF is marked only by phrasal stress.

There is, however, another important factor that has to be considered in the discussion. All the experiments mentioned above only examined SOF expressions in a *postnuclear* position, which is subject to a *deaccenting* effect that is independent of its information structural status. The seeming difference between the kind of accent needed for FOF and the one needed for SOF may be simply a consequence of this deaccenting effect, instead of the difference of the focus types. We will show below that in a *prenuclear* position, there is pitch prominence on SOF as compared to non-focused counterpart. We will propose that deaccenting is a consequence of postnuclearity, a phonological effect that is independent of the focus or non-focus status of SOF, an effect compatible with Rooth's and Beaver et al.'s results. But we also found that SOF

expressions are accented when they are prenuclear. As soon as SOF expressions are in a phonological environment where they can be accented, they are accented. This is demonstrated in the next section. Our experiment was conducted with German data, but we expect that our general conclusions are valid for English as well, since those aspects of intonation which bear on SOF are similar in both languages.

3 Experiment

3.1 Stimuli

All the experiments on SOF we are aware of investigate the occurrence of SOF in a postnuclear environment. Our experience of intonation, however, is that postnuclear environments are not the best place to look for differences in pitch as a consequence of prominence. Reliable occurrences of non-nuclear accents in German and in English are on prenuclear material, in other words, on the material located before the main focus of the sentence. Therefore, in our material, we investigated realizations of SOF in a prenuclear position as well as those in a postnuclear position.

Six expressions, underlined in (5), were chosen as the target expressions. Three of the target expressions (5a–c) were inserted in the subject position, and the other three (5d–f) in the object position. Hereafter, we will call the former group the *subject set* and the latter the *object set*. Three different focus operators were used in our stimuli: *nur* 'only', *auch* 'also', *sogar* 'even,' as shown in (5).

(5) Stimulus expressions

a. Nur Peter hat eine Krawatte getragen.
only Peter has a tie worn
'Only Peter wore a tie.'

b. Auch Melina hat beim Aufbau mitgeholfen.
also Melina has at.the assembly helped
'Also Melina helped at the assembly.'

c. Sogar Monika hat Mailand geliebt.
even Monika has Milan loved
'Even Monika loved Milan.'

d. Eva hat nur ihren Bruder eingeladen.
Eva has only her brother invited
'Eva only invited her brother.'

e. Ingo hat auch einen Jaguar gekauft.
Ingo has also a jaguar bought
'Ingo also bought a jaguar.'

f. Michael hat sogar ein Lied gesungen.
Michael has even a song sung
'Michael even sang a song.'

Each expression is inserted in five different contexts: (i) FOF, (ii) prenuclear SOF, (iii) postnuclear SOF, (iv) prenuclear Non-Focus, and (v) postnuclear Non-Focus

context. Thanks to the V2 property of German, we can place SOF and Non-Focus expressions in different locations, either sentence-initially (prefield) or sentence-medially (middle field). When SOF and Non-Focus are in the sentence-initial position, they are followed by a nuclear pitch accent. We call them prenuclear SOF and prenuclear Non-Focus, respectively. When they are in the sentence-medial position, they are preceded by a nuclear accent in the sentence-initial position, hence becoming the postnuclear SOF/Non-Focus.

One complete set of contexts (from the subject sets) is illustrated in (6). (6a) is the FOF sentence, (6b) and (6c) the SOF sentences. Notice that the context eliciting SOF is identical to the FOF sentence (6a). The SOF in (6b) is located in a prenuclear position, while that of (6c) is located postnuclearly. (6d) and (6e) are pre-/postnuclear Non-Focus contexts, respectively, where the target words are already mentioned in the preceding wh-questions, and no focus operator is involved.

(6) Contexts for one of the subject sets

a. *FOF*
[Die meisten unserer Kollegen waren beim Betriebsausflug lässig angezogen.
'Most of our colleagues were dressed casually at the staff outing.']
Nur Peter hat eine Krawatte getragen. 'Only Peter wore a tie.'

b. *SOF: Prenuclear*
[Die meisten unserer Kollegen waren beim Betriebsausflug lässig angezogen.
Nur Peter hat eine Krawatte getragen. =(6a)]
Nur Peter hat sogar einen Anzug getragen. 'Only Peter even wore a suit.'

c. *SOF: Postnuclear*
[Die meisten unserer Kollegen waren beim Betriebsausflug lässig angezogen.
Nur Peter hat eine Krawatte getragen. =(6a)]
Sogar einen Anzug hat nur Peter getragen. 'Only Peter even wore a suit.'

d. *Non-Focus: Prenuclear*
[Wen hat Peter geküsst? 'Who did Peter kiss?']
Peter hat Maria geküsst. 'Peter kissed Maria.'

e. *Non-Focus: Postnuclear*
[Wen hat Peter geküsst?]
Maria hat Peter geküsst.

As for the FOF context, (a) sentences in the subject set contain FOF expressions in a sentence-initial position, while those in the object set (4a–6a) contain FOF expressions in the sentence-medial position. In both cases, FOF bears a nuclear accent since no accent follows in the sentence. One of the sentence-medial FOF examples (i.e., (a) examples in the object set) is given in (7).

(7) FOF context for one of the object sets
   a. [Viele Frauen haben mehrere Verwandte zum Dorffest eingeladen.
   'Many women have invited several relatives to the village fair.']
   Aber Eva hat nur ihren Bruder eingeladen.
   'But Eva only invited her brother.'

In sum, our material has six conditions, comparing location of focus (sentence-initial and sentence-medial) and focus type (FOF, SOF, Non-Focus).[1]

With this material, we will examine the following two hypotheses. First, we expect to find a three-way difference between FOF, SOF, and Non-Focus, FOF being the most prominent and Non-Focus the least (Hypothesis A). Second, we also expect different realizations of the three focus types according to their location in a sentence, the sentence-initial FOF/SOF/Non-Focus being more prominent than the sentence-medial counterparts (Hypothesis B). We use the term 'prominence' as a cover word for both pitch and duration.

(8) Hypotheses
   A. FOF words are more prominent than SOF words which are themselves more prominent than Non-Focus words.
   B. Sentence-initial words are more prominent than sentence-medial ones.

3.2 Recordings

Recordings were made in a sound-proof booth on a DAT recorder. A short set of instructions familiarized the subjects with the procedure and made them practice with a few examples. The contexts and answers were presented in a PowerPoint presentation, in a series of two slides per stimulus. On the first slide, the context was presented both acoustically and visually, and the target sentence appeared on the second slide. The informant read the sentences as naturally as possible. The experiment was self-paced and the speakers were instructed to repeat the sentences if they felt that they had made a mistake.

The 30 sentences used for this experiment were part of a larger production experiments, including 200 sentences altogether. Each context was organized in one block of the 6 different sentences. The blocks were separated from each other by 17 or 20 other sentences. Our speakers were 15 female students at the University of Potsdam. They were reimbursed for their time. They were monolingual speakers of German in their twenties, coming from the Northern area of Germany.

3.3 Measurements

The recordings were analyzed using the acoustic speech analysis software Praat© (Boersma and Weenink 1992–2006). The sound waves were manually divided into

[1] See Féry & Ishihara (2005) for a complete list of stimuli.

labeled sub-strings with the help of spectrograms. The divisions assigned one or two domains of measurements, depending on whether there was an article (or a possessive) preceding the target noun, as illustrated in (9b). In (9a) only one domain was defined, whereas in (9b), two were needed. The measurement on the article was necessary because in many cases, the falling nuclear accent started on the syllable preceding the accented syllable, a phenomenon called 'early peak.' This is well documented in the literature on German intonation (Kohler 1990), and it is visible in Fig. 1-ii below.

(9) a. Nur # Peter # hat sogar einen Anzug getragen.
b. Auch Eva hat nur # ihren # Bruder # eingeladen.

Two values were measured. First, the highest peak of the domain defined by the target noun (plus the preceding article when present), and second, the duration of the target noun (not including the article). The values were assigned by a script in Praat, but the authors manually verified all the sentences. In approximately 30% of the cases, changes were necessary because of microprosodic distortions in the pitch-tracks (especially in the noun *Peter* and *Monika*). Statistic analyses were done using the statistical computing environment R.

4 Results

Figure 1 illustrates examples of realizations for the six contexts: (i) sentence-initial FOF, (ii) sentence-medial FOF, (iii) prenuclear SOF, (iv) postnuclear SOF, (v) prenuclear Non-Focus, and (vi) postnuclear Non-Focus. From these pitch tracks one can see that sentence-initial/medial FOF (i.e., nuclear elements) (i, ii) as well as prenuclear SOF/Non-Focus (iii, v) preserve accents of the target expression (*Peter, Bruder*), but that this is not true for postnuclear SOF/Non-Focus (iv, vi).

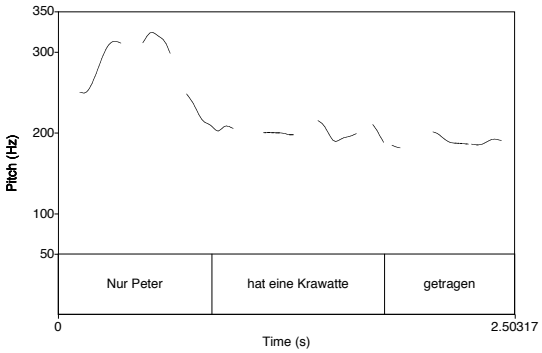


Figure 1-i: FOF: Sentence-initial

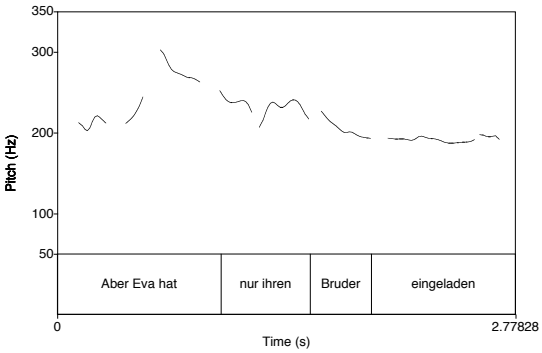


Figure 1-ii: FOF: Sentence-medial

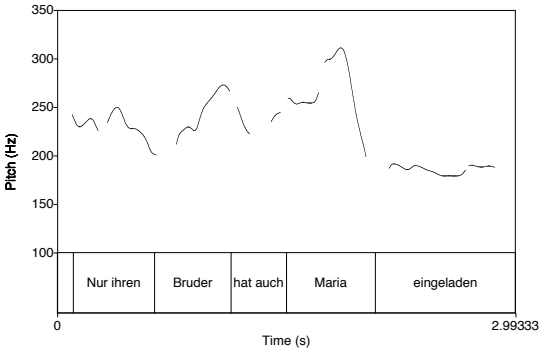


Figure 1-iii: SOF: Prenuclear

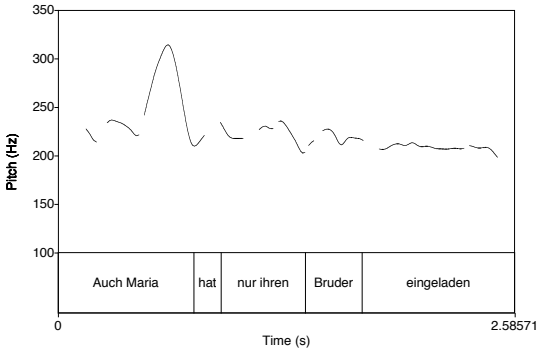


Figure 1-iv: SOF: Postnuclear

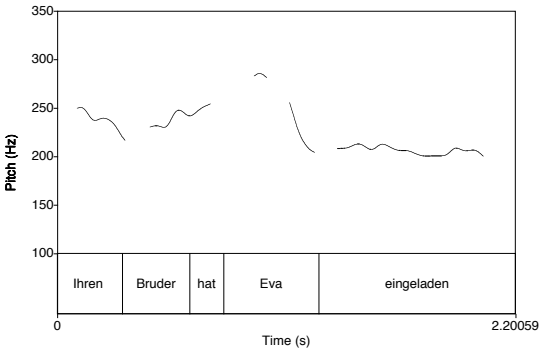


Figure 1-v: Non-Focus: Prenuclear

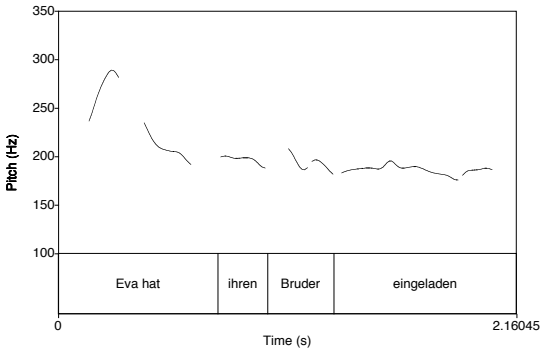


Figure 1-vi: Non-Focus: Postnuclear

Figure 1: Pitch tracks of the six conditions by one speaker

4.1 Pitch (F_0)

Figure 2 shows the mean highest F_0 on the target expression for each context. The dark bars are for the sentence-initial/prenuclear contexts, the light ones for the sentence-medial/postnuclear sentences.[2]

A comparison of the three sentence-initial contexts (dark bars in Figure 2) reveals that our first hypothesis (8a) regarding the focus type is confirmed. Sentence-initially, (nuclear) FOF is realized higher than prenuclear SOF, which itself is realized higher than prenuclear Non-Focus. The contrast between FOF and SOF is statistically significant (one sided t-test, $t(133) = 2.4917$, $p = 0.00697$), as is the contrast between SOF and Non-Focus (one sided t-test, $t(178) = 5.2187$, $p = 2.490e\text{-}07$).

In the sentence-medial contexts (light bars in Figure 2), however, the contrast between the two postnuclear elements, SOF and Non-Focus, is no longer detectable. The contrast is statistically not significant (one sided t-test, $t(178) = 0.8292$, $p = 0.2040$). This fact appears to indicate that Hypothesis A does not hold in a postnuclear context.

[2] Note that we measured only the target expression in each sentence. Therefore the results in Figure 2 do NOT indicate the relative height between FOF and SOF in the same sentence (e.g., *Anzug* and *Peter* in (6b,c)), or the one between FOF and Non-Focus (e.g., *Maria* and *Peter* in (6d,e)).

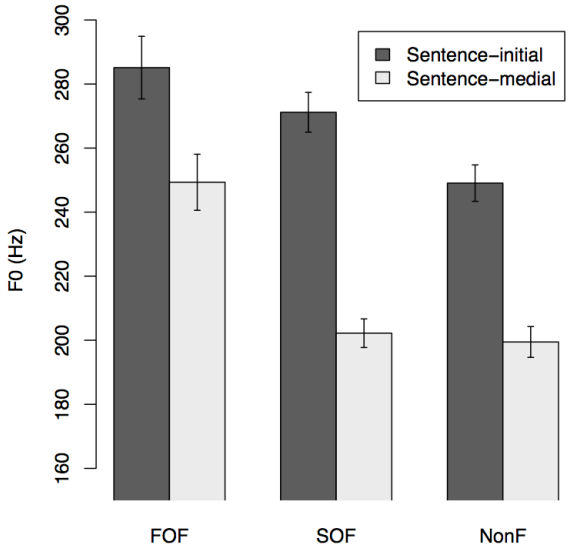


Figure 2: Mean F_0 for FOF/SOF/Non-Focus in sentence-initial/medial conditions (with 95% CI)

In an information structurally neutral ('all-new') context, the rightmost stressed syllable in the utterance bears the nuclear stress, and attracts the nuclear pitch accent. When a narrow focus (i.e., FOF) is assigned somewhere else, it is this FOF that attracts the nuclear pitch accent. In such cases, all the following pitch accents are lost, or considerably reduced.[3] In a postnuclear SOF and Non-Focus, complete deaccenting was observed in all realizations. Postnuclear deaccenting on the postnuclear SOF and Non-Focus obliterates the expected contrast between them.

This is also the reason why the contrasts between FOF and the other two contexts (SOF/Non-Focus) are much larger sentence-medially than sentence-initially. In the sentence-medial position, FOF bears the nuclear accent, while postnuclear SOF/Non-Focus are deaccented. In the sentence-initial position, on the other hand, FOF, SOF, and Non-Focus are all accented. We can therefore deduce that the sentence-initial contrast is a pure effect due to the difference of the focus type, while the sentence-medial contrast is a combination of focus type effect and postnuclear deaccenting.

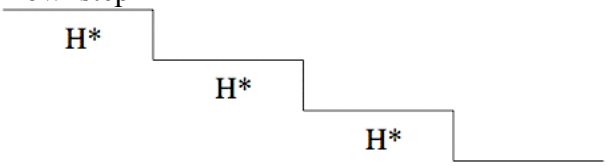
We can explain the focus type hierarchy by assuming two information-structure related effects: F_0-boosting due to focus, and F_0-reduction due to givenness. FOF, being focus and new, only receives F_0-boosting effect. SOF, being both focus and given, is subject to both the F_0-boosting and reduction. Non-Focus, being given, is only reduced. The contrast among the three focus types can be best observed in sentence-initial position, where the postnuclear deaccenting does not interfere.

[3] A similar phenomenon is also observed in Japanese. When a phrase receives a narrow focus interpretation, an F_0-boosting is observed on the focused phrase, and pitch contour of all the following phrases are compressed. See Ishihara 2003 and references therein.

In Figure 2, we also see that our second hypothesis (8b), concerning the difference between pre- and postnuclear accent realization, is confirmed: In all three focus types, sentence-initial expressions are realized higher than their sentence-medial counterparts. As for the SOF contexts, the mean difference between pre- and postnuclear SOF is statistically significant (one sided t-test, $t(161.627) = 17.9179$, $p < 2.2e\text{-}16$). The same is true for Non-Focus: the mean difference between the pre- and postnuclear Non-Focus is statistically significant (one sided t-test, $t(178) = 13.2299$, $p < 2.2e\text{-}16$).

The contrast between sentence-initial and sentence-medial FOF is also statistically significant (one sided t-test, $t(88) = 5.4936$, $p = 1.889e\text{-}07$). Recall, however, that the FOF data are not involved in pre-/postnuclearity contrast, because FOF always bears a nuclear accent. Instead, the difference in prominence is due to downstep, as schematically illustrated in (10). In the course of a sentence, accents are downstepped relatively to immediately preceding ones (see for instance Ladd 1984). A pitch accent later in a sentence is therefore realized lower than a sentence-initial pitch accent. Accordingly, sentence-initial FOF is realized higher than sentence-medial FOF.

(10) Downstep



In sum, we have found the following for pitch (11):

(11) Summary for pitch

a. Hypothesis A (focus type):
In a sentence-initial/prenuclear position, the focus type hierarchy (FOF > SOF > Non-Focus) was established for pitch.
In a sentence-medial/postnuclear position, the contrast between SOF and Non-Focus is obliterated by deaccenting.

b. Hypothesis B (sentence position):
Sentence-initial FOF is realized higher than sentence-medial FOF, due to downstep.
Prenuclear SOF/Non-Focus is realized higher than postnuclear SOF/Non-Focus, due to postnuclear deaccenting.

4.2 Duration

Since we have target expressions with different numbers of syllables (3 syllables for *Monika*, *Melina* and *Jaguar*[4], 2 for *Peter* and *Bruder*, 1 for *Lied*), we performed a regression analysis to factor out the effect of syllable length on duration. Figure 3 shows the mean residual durations for FOF, SOF, and Non-Focus, both in sentence-initial and in

[4] A word like *Jaguar* with a hiatus between the second and third syllable can be pronounced as a bi- or a trisyllabic word. Our measurements speak for a length comparable to a trisyllabic word in our data.

sentence-medial position. The higher residual value indicates the longer duration (i.e., the negative value found for Non-Focus is of shorter duration than the positive ones for FOF and SOF).

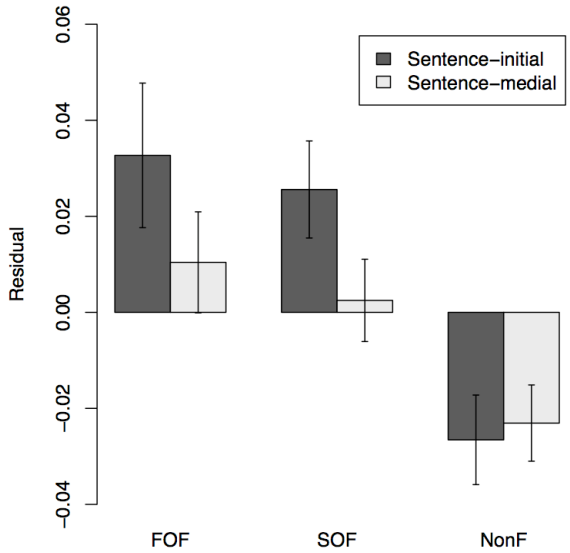


Figure 3: Mean residual duration for FOF/SOF/Non-Focus
in sentence-initial/medial contexts (with 95% CI)

Let us first consider the result in terms of Hypothesis A (i.e., FOF > SOF > Non-Focus hierarchy). In the case of duration, the SOF > Non-Focus hierarchy is confirmed both in prenuclear and postnuclear contexts, unlike pitch, for which the contrast between SOF and Non-Focus was absent in postnuclear contexts. However, there is no significant difference between FOF and SOF, both sentence-initially and sentence-medially. All results for duration are shown in (12) and (13).

(12) SOF vs. Non-Focus — Significant
  a. Prenuclear: one sided t-test, t(176.862) = 7.5345, p = 1.218e-12
  b. Postnuclear: one sided t-test, t(176.945) = 4.3461, p = 1.166e-05

(13) FOF vs. SOF — Not significant
  a. Sentence-initial: one sided t-test, t(85.171) = 0.7864, p = 0.2169
  b. Sentence-medial: one sided t-test, t(101.378) = 1.1694, p= 0.1225

As far as Hypothesis A is concerned, the results are twofold. First, there is a clear difference in duration between focused (i.e., FOF/SOF) and Non-Focus material, regardless of the sentence position. Second, there is no significant distinction between FOF and SOF, again regardless of sentence position. Remember that in the case of pitch, the contrast between SOF and Non-Focus is absent in the postnuclear context, and that there is a significant difference between FOF and SOF both sentence-initial and sentence-medially. We need to explain these differences between pitch and duration with respect to Hypothesis A.

We suggest that the focus has a lengthening effect, while givenness does not affect the duration. Focus lengthens both FOF and SOF equally, while givenness does not affect the output, unlike in the case of pitch. As a result, the contrast is only observed between focused phrase (FOF/SOF) and Non-Focus, while no significant difference is found between FOF and SOF.

Let us now examine the sentence-initial/medial contrast (Hypothesis B) in duration. The contrast is statistically significant in FOF (one sided t-test, $t(88) = 2.4452$, $p = 0.008235$) and in SOF (one sided t-test, $t(173.415) = 3.462$, $p = 0.0003376$), but not in Non-Focus context (two sided t-test, $t(173.576) = -0.5656$, $p = 0.5724$). This result is again different from that of pitch, in which the sentence-initial/medial contrast was significant in all three contexts. Again we need a separate explanation for duration.

The best candidate for the source of this contrast appears to be prosodic phrasing. We observed above that focus has a lengthening effect. This lengthening effect of focus is stronger at the sentence-initial position than in the sentence-medial position. Focused material (FOF and SOF) in the sentence-initial position tends to form a prosodic phrase of its own (as one can see from Figure 1-i and 1-iii above). As a result, the duration of the material increases, due to phrase-final lengthening. Focused material in the sentence-medial position, on the other hand, is included in a larger prosodic phrase (cf. Figure 1-ii, 1-iv). Accordingly, although it would show a focus-driven lengthening effect, this is not as large as in the sentence-initial position. Non-Focus phrases (both pre- and postnuclear ones) do not form a separate prosodic phrase. Nor do they show a focus-lengthening effect (cf. Figure 1-v, 1-vi).

In sum, we have found the following for duration:

(14) Summary for duration
   a. Hypothesis A (focus type):
      The contrast in duration is attested only between focused (FOF/SOF) and non-focused (Non-Focus) contexts. No significant difference between FOF and SOF.
   b. Hypothesis B (sentence position):
      A sentence-initial target is realized longer than a sentence-medial target only in FOF and SOF.

5 Conclusion

In this paper second occurrence focus was investigated for German. Until now, this phenomenon had been exclusively looked at from the point of view of its implications for semantic theories of focus. Weak theories of focus, which require (pitch) accents on elements associated with a focus operator, have been thought to be jeopardized if SOF is realized without any prominence. Strong theories of focus, which propose that focus is modulated by contextual effects, cannot explain why SOF can be accented at all, since an accent is not necessary in order for the SOF to be correctly interpreted. We tackle the

issue from a different angle and discuss the phenomenon from the point of view of phonology.

The results of our experiments in German, bearing on the phonetic correlates of first occurrence focus (FOF), second occurrence focus (SOF) and unfocused (Non-F) expressions, both in sentence-initial/prenuclear and sentence-medial/postnuclear contexts, indicate that it is crucial to keep issues of semantic theories and the phonological realization of accents apart. Especially, it is important to distinguish the phonological effects that are related to information structure (such as focus F_0-boosting/lengthening and givenness F_0-reduction) and those that are independently motivated (such as downstep and postnuclear deaccenting). Prenuclear SOF is realized with pitch accents, albeit weaker than the FOF counterpart, but stronger than Non-Focus. In a postnuclear context, by contrast, no mark of pitch realization could be identified, though, as Rooth (1996), Bartels (2004) and Beaver et al. (2004) found for English, SOF had a longer duration than Non-Focus. We conclude that the absence of accent may be due to purely phonological factors.

References

Bartels, Christine. 2004. Acoustic correlates of 'second occurrence' focus: Towards an experimental investigation. In *Context-dependence in the analysis of linguistic meaning*, ed. Hans Kamp and Barbara H. Partee, 354–361. Amsterdam: Elsevier.

Beaver, David I., Brady Z. Clark, Edward S. Flemming, T. Florian Jäger and Maria K. Wolters (2004): When semantics meets phonetics: Acoustical studies of second occurrence focus. Ms., Stanford University.

Féry, Caroline and Shinichiro Ishihara. 2005. Interpreting second occurrence focus. Ms., University of Potsdam. [Available at `http://www.sfb632.uni-potsdam.de/`]

von Fintel, Kai. 2004. A minimal theory of adverbial quantification. In *Context-dependence in the analysis of linguistic meaning*, ed. Hans Kamp and Barbara H. Partee, 137–175. Amsterdam: Elsevier.

Ishihara, Shinichiro. 2003. Intonation and Interface Conditions. Doctoral dissertation, MIT, Cambridge, Mass.

Jackendoff, Ray S. 1972. *Semantic interpretation in generative grammar*. Cambridge, Mass.: MIT Press.

Kohler, Klaus. J. 1990. Macro and micro F_0 in the synthesis of intonation. In *Papers in Laboratory Phonology I: Between the Grammar and the Physics of Speech*, ed. John Kingston and Mary Beckman, 115–138.

Krifka, Manfred. 2004. Focus and/or context: A second look at second occurrence expressions. In *Context-dependence in the analysis of linguistic meaning*, ed. Hans Kamp and Barbara H. Partee, 187–207. Amsterdam: Elsevier.

Ladd, Robert D. 1984. Declination: A review and some hypotheses. *Phonology Yearbook* 2:53–74.

Partee, Barbara H. 1999. Focus, quantification, and semantics-pragmatics issues. In *Focus: Linguistic, Cognitive, and Computational Perspectives*, ed. Peter Bosch and Rob van der Sandt, 213–231. Cambridge, UK: Cambridge University Press.

Rooth, Mats. 1985. Association with focus. Doctoral dissertation, University of Massachusetts, Amherst.
Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1:75–116.
Rooth, Mats. 1996. On the interface principles for intonational focus. In *SALT VI*, ed. T. Galloway and J. Spence, 202–226. Ithaca, NY.
Rooth, Mats. 1999. Association with focus or association with presupposition? In *Focus: Linguistic, Cognitive, and Computational Perspectives*, ed. Peter Bosch and Rob van der Sandt, 232–244. Cambridge, UK: Cambridge University Press.
Rooth, Mats. 2004. Comments on Krifka's paper. In *Context-dependence in the analysis of linguistic meaning*, ed. Hans Kamp and Barbara H. Partee, 475–487. Amsterdam: Elsevier.
Sugahara, Mariko. 2003. Downtrends and post-FOCUS intonation in Japanese. Doctoral dissertation, University of Massachusetts, Amherst.

Universität Potsdam
SFB632 „Informationsstruktur"
Postfach 601553
14415 Potsdam
Germany

s_i@alum.mit.edu
caroline.fery@gmail.com

http://www.sfb632.uni-potsdam.de/