

# Syntactic base positions for adjuncts? Psycholinguistic studies on frame and sentence adverbials

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**ABSTRACT** Syntactic approaches to the positioning of adjuncts (e.g., [Frey and Pittner \(1998\)](#), [Maienborn \(2001\)](#), [Frey \(2003\)](#), [Pittner \(2004\)](#), [Steube \(2006\)](#)) postulate base positions for frame as well as for sentence adverbials above the entire proposition. The question arises how these two adverbial types are positioned in relation to each other. Syntactic accounts respond differently to this question. Furthermore, the role of semantic and pragmatic factors for the positioning of adverbials is disputable. The current paper presents the results of two psycholinguistic experiments that provide evidence for a base position account of frame and sentence adverbials. Furthermore, a non-syntactic factor – namely the referentiality of frame adverbials – is shown to influence position preferences.

*Keywords:* adverbials, adjuncts, processing, frame adverbials, sentence adverbials, base positions

## 1 Introduction

Adverbials have played a prominent role in the grammar theory of the last 20 years. With regard to the positioning of adverbials, several different theories exist. One class of approaches assumes that adverbials are freely generated in different syntactic positions. Restrictions on adjunct placement are considered to be semantic in nature (e.g., [Hetland, 1992](#); [Neeleman, 1994](#); [Haider, 2000, 2012](#); [Ernst, 2002](#)). Another class of approaches supposes that syntax imposes strict ordering conditions on adverbials. Adverbials are located in fixed syntactic positions which are determined by different lexical-semantic properties ([Alexiadou, 1997](#); [Cinque, 1999](#)).

Another less radical syntactic approach to the order of adverbials in the German middle field (i.e., the region between the complementizer/finite verb and the verb in its base position) has been put forward by different authors (e.g., [Frey and Pittner, 1998](#); [Maienborn, 2001](#); [Frey, 2003](#); [Pittner, 2004](#); [Steube, 2006](#)). It has been argued that not only arguments, but also adjuncts do in fact have base positions in the German middle field, but these positions are not as rigidly determined as in Cinque's and Alexiadou's view. Instead, adjuncts do not have to appear in their base position, but can scramble the same way as arguments. However, an adverbial's syntactic surface position is crucial because it influences interpretation. Some adverbials can appear in different syntactic positions whereupon they get different readings depending on the position. [Frey and Pittner \(1998\)](#), [Frey \(2003\)](#) and [Pittner \(2004\)](#) classify adverbials on the basis of their lexical-semantic properties into several adverbial types (like 'temporal adverbial', 'manner adverbial', etc.), which they group in a further step into five different syntactic classes, each adverbial class having a different base position. To obtain evidence for the assumed base position of a certain class, the authors apply established argument base position tests to adjuncts (e.g., the position of wh-phrases interpreted as

indefinites, complex prefields, focus projection data or the scopal behavior of quantified phrases).

Our paper will concentrate on the less radical base position approaches for adjuncts introduced above. Thereby, our aim is to find an answer to the question whether the assumption of base positions for adjuncts is empirically founded. We will try to do so by considering the position of two types of adjuncts: frame adverbials and sentence adverbials. Amongst the advocates of a base position approach there are different assumptions with regard to the order of these two adverbial types relative to each other. We will test predictions derived from these theoretical considerations in two experimental studies.

## 2 Theoretical background: Where are frame and sentence adverbials positioned?

Sentence adverbials like *leider* ('unfortunately'), *wahrscheinlich* ('probably'), *anscheinend* ('apparently'), *erfreulicherweise* ('fortunately'), etc. express a speaker's attitude towards the proposition. Frame adverbials, on the other hand, are usually local or temporal adverbials that set up a frame for the interpretation of the whole sentence. Frame-setting modifiers are not part of what is properly asserted but restrict the speaker's claim (see, e.g., [Maienborn, 2001](#)). They restrict the proposition's validity to certain places or times, compare *in Deutschland* ('in Germany') in (1).

- (1) In Deutschland bin ich weltberühmt.  
*in Germany am I world-famous*  
 'In Germany, I am world-famous.'  
 (Harald Juhnke, radio interview 1998, quot. [Maienborn \(2001, p. 227\)](#))

Thus semantically both adverbial types apply to the proposition. For that reason, base position approaches assign both adverbials a base position above the verb and its participants (if one assumes a standard model, it would be adjunction to IP). So the question arises how these two types of adverbials are positioned in relation to each other.

Base position approaches answer this question differently. [Frey and Pittner \(1998, p. 521\)](#) assume that frame adverbials delimit the frame with respect to which the validity of the rest of the proposition is evaluated. Hence the whole remaining material has to appear in their c-command domain – which means that they also c-command sentence adverbials. The authors judge (2a) with the frame adverbial above the sentence adverbial as fully acceptable, and (2b) with the frame adverbial below the sentence adverbial as marked. [Frey and Pittner \(1998, p. 520\)](#) conclude that the frame adverbial's base position is above sentence adverbials.

- (2) a. weil im Mittelalter erstaunlicherweise die Mönche  
*because in the Middle Ages astonishingly the monks*  
 während der Fastenzeit viel Bier tranken.  
*during Lent lots of beer drank*
- b. ?weil erstaunlicherweise im Mittelalter die Mönche während  
*because astonishingly in the Middle Ages the monks during*  
 der Fastenzeit viel Bier tranken.  
*Lent lots of beer drank*
- 'because in the Middle Ages, astonishingly the monks drank lots of beer during Lent.'

[Maienborn \(2001\)](#) has a similar view on the base order of these two adverbial types. The following examples motivate her assumptions ([Maienborn, 2001, p. 210f](#)).

- (3) a. Paul hat wahrscheinlich in Bolivien Weihnachten gefeiert.  
*Paul has probably in Bolivia Christmas celebrated*  
 ‘Paul probably celebrated Christmas in Bolivia.’
- b. Paul hat in Bolivien wahrscheinlich Weihnachten gefeiert.  
*Paul has in Bolivia probably Christmas celebrated*  
 ‘In Bolivia, Paul probably celebrated Christmas.’

(3a) exhibits an event-external reading of the local adverbial *in Bolivien* (‘in Bolivia’): probably it is true that Paul celebrated Christmas in Bolivia. By contrast, the interpretation of (3b) is a frame setting one: as long as he was in Bolivia, Paul probably celebrated Christmas. It seems that the positioning of a local adverbial below or above a sentence adverbial is responsible for an event-external reading or a frame setter reading. This observation leads to the conclusion that frame setters c-command sentence adverbials.

[Frey \(2003\)](#) points to the fact that information structural factors play a role in positioning these two adverb types. In [Frey \(2000, 2004\)](#), he argues for the existence of a syntactic topic position in the German middle field which is above sentence adverbials and is reserved for aboutness topics (see [Reinhart, 1981](#)). Every element that is marked as an aboutness topic has to move in this position, and every element that appears in this position is marked as an aboutness topic. Elements cannot be base generated in this position.

Using the examples in (4), [Frey \(2003, p. 168\)](#) demonstrates that non-referential frame adverbials cannot appear above a sentence adverbial – because only referential elements can be aboutness topics (see, e.g., [Reinhart, 1981](#)).

- (4) a. \*Otto ist in keinem Land erstaunlicherweise sehr berühmt.  
*Otto is in no country astonishingly very famous*
- b. Otto ist erstaunlicherweise in keinem Land sehr berühmt.  
*Otto is astonishingly in no country very famous*  
 ‘Astonishingly, Otto is very famous in no country.’

In (4a), the non-referential frame adverbial *in keinem Land* (‘in no country’) is positioned above the sentence adverbial *erstaunlicherweise* (‘astonishingly’). Frey marks this sentence as ungrammatical, whereas he judges (4b) with a non-referential frame adverbial below the sentence adverbial as grammatical. A non-referential element like the frame adverbial *in keinem Land* (‘in no country’) has to appear in its base position which is below sentence adverbials.

But what about referential frame adverbials? The question arises whether those can be interpreted as aboutness topics. A topic in Frey’s and Reinhart’s terms is an expression whose referent the sentence is about. [Frey \(2000, 2003, 2004\)](#) claims that a referential frame setting term can become such an expression: “If a frame adjunct is referential it may be positioned in the topic field above the SADJs [sentence adjuncts, MS and BS] [...], this means that an appropriate frame adjunct can become an aboutness topic” ([Frey 2003, p. 169](#)). But referential frame adverbials are not necessarily aboutness topics. If they are not, their position is below sentence adverbials, as in (5a) If they are, then they are moved to the derived position above sentence adverbials as illustrated in (5b) (see [Frey, 2003, p. 169](#)).

- (5) a. Otto ist erstaunlicherweise in Deutschland sehr berühmt.  
*Otto is astonishingly in Germany very famous*
- b. Otto ist [in Deutschland]<sub>i</sub>; erstaunlicherweise <sub>t<sub>i</sub></sub> sehr berühmt.  
*Otto is in Germany astonishingly very famous*  
 ‘In Germany, Otto astonishingly is very famous.’

Nevertheless, it is not clear what it exactly means for a frame adverbial to be the sentence topic. A frame adverbial does not establish the referent the sentence is about, but restricts the speaker’s claim to a certain domain. It is not part of the assertion.

There are alternative topic concepts that connect frame adverbials with topicality ([Chafe, 1976](#); [Jacobs, 2001](#)). [Chafe \(1976\)](#) introduces the so-called Chinese-style topic in addition to the classical concept of aboutness topic. Chinese-style topics set up a spatial, temporal or individual frame within which the main predication holds. This description resembles the definition of frame adverbials introduced above. In [Jacobs’ \(2001\)](#) view, topic-comment constructions exhibit up to four prototypical properties. One of these properties is frame setting.

[Krifka \(2007, 2008\)](#) on the other hand assumes that this kind of topic concept has to be distinguished from the aboutness concept. He assumes that there are at least two functions of topics, addressation and delimitation. Whereas aboutness topics function as addresses, frame setters (amongst other linguistic means) can fulfill the delimitation function. Even though these two functions have to be differentiated, there are also commonalities between them:

Addressing involves the **selection** of a discourse referent as the address to which information is added. This applies in particular to shifting topics that pick out a nonsalient discourse referent [...] Delimitation involves the **selection** of a certain aspect under which the context question can be broken down, under which the requested information can be given, at least in part. [...] Hence: Both addressing and delimitation involve selection; more specifically, selection concerning the way **how** something should be said, and not **what** should be said, i.e. not the focus associated with the answer to questions. This explains why the marking strategies of addressation and delimitation are often very similar [...] ([Krifka, 2008, p. 4](#)).

Other accounts also point to information-structural constraints on the positioning of frame and sentence adverbials. [Pittner \(2004\)](#) assumes that non-referential frame adverbials have their base position below sentence adverbials. Referential frame adverbials in her view are generally Chinese-style topics in the sense of [Chafe \(1976\)](#) and move to a position above sentence adverbials. [Steube \(2006\)](#) also assumes that frame adverbials’ base position is below sentence adverbials. Usually, frame adverbials are referential as well as contextually bound, in which case they move above sentence adverbials. So it seems that according to both accounts referential frame adverbials obligatorily move to a position above sentence adverbials.

On the basis of these theoretical considerations, the question arises whether frame and sentence adverbials do have base positions in relation to each other. And if so, whether semantic and pragmatic factors like referentiality (and topicality) of the frame adverbial influence positioning.

### 3 Experimental evidence

We conducted two experiments: Experiment 1 used an acceptability judgment task and Experiment 2 measured reading times.

The experiments address the question of whether frame and sentence adverbials do have base positions in relation to each other. A further question is whether syntactic positioning can be influenced by the referentiality of the frame adverbial. Therefore, sentence materials as shown in (6) were used, manipulating the factors *referentiality* of the frame adverbial (referential vs. non-referential) as well as its *position* in relation to a sentence adverbial (early vs. late).

- (6) a. Eva meint, dass wahrscheinlich auf Mallorca alle Urlauber betrunken sind.  
*Eva thinks that probably on Majorca all tourists drunk are*  
 ‘Eva thinks that probably on Majorca all tourists are drunk.’
- b. Eva meint, dass auf Mallorca wahrscheinlich alle Urlauber betrunken sind.  
*Eva thinks that on Majorca probably all tourists drunk are*  
 ‘Eva thinks that on Majorca probably all tourists are drunk.’
- c. Eva meint, dass wahrscheinlich auf keiner Insel alle Urlauber betrunken sind.  
*Eva thinks that probably on no island all tourists drunk are*  
 ‘Eva thinks that probably on no island all tourists are drunk.’
- d. Eva meint, dass auf keiner Insel wahrscheinlich alle Urlauber betrunken sind.  
*Eva thinks that on no island probably all tourists drunk are*  
 ‘Eva thinks that on no island probably all tourists are drunk.’

#### *Hypotheses:*

- (1) If referential and non-referential frame adverbials do in fact prefer different positions in relation to sentence adverbials (as it is postulated by [Frey, 2003](#); [Pittner, 2004](#) and [Steube, 2006](#)), an interaction of the two factors *referentiality* and *position* is expected.
- (2) If non-referential frame adverbials exhibit a preference for the assumed base position of frame adverbials (i.e., a position below sentence adverbials), we expect higher acceptability ratings and faster reading times for sentences like (6c), with the frame adverbial following the sentence adverbial, than for sentences like (6d).
- (3) If referential frame adverbials obligatorily move to a position above sentence adverbials, as assumed by [Steube \(2006\)](#) and [Pittner \(2004\)](#), higher ratings and faster reading times are predicted for sentences like (6b), with the frame adverbial preceding the sentence adverbial, than for (6a). If on the other hand Frey’s assumption is right that referential frame adverbials could appear preceding as well as following sentence adverbials depending on their topical status, no difference in the comparison of the conditions (6a) and (6b) should be observed.
- (4) If a moved element per se causes processing costs (which is true for argument processing, see, e.g., [Bader, Meng, Bayer, and Hopf, 2000](#) for an overview) and if the base position of frame adverbials follows sentence adverbials, we predict longer reading times and lower ratings for sentences like (6b and d) compared to (6a and c).

### **3.1 Experiment 1: Acceptability judgment task**

#### **3.1.1 Method**

##### **3.1.1.1 Participants**

64 students of the University of Tübingen participated in this study. All were German native speakers and were paid for participation.

### 3.1.1.2 Materials

The two factors manipulated in the materials are the *referentiality* of the frame adverbial (referential vs. non-referential) and its *position* relative to the sentence adverbial (early vs. late) (see sample item in (6)). Both factors were manipulated within items, so that 24 sentence quadruples (items) were constructed. The materials are provided in the Appendix.

The sentence adverbials were either epistemic (*wahrscheinlich* ('probably'), *möglicherweise* ('possibly'), *vermutlich* ('presumably'), *sicherlich* ('surely')) or evidential (*angeblich* ('allegedly'), *anscheinend* ('apparently'), *offenbar* ('obviously'), *tatsächlich* ('actually')).<sup>1</sup> Each adverb appeared in three items. All frame adverbials were local modifiers; each referential one appeared in one of the items, whereas each non-referential one appeared in two items, e.g., the equivalent for the two referential adverbials *auf Mallorca* ('on Majorca') and *auf Sylt* ('on Sylt') was *auf keiner Insel* ('on no island'). This results in 24 different referential frame adverbials and 12 non-referential ones.

With regard to frame adverbials, [Pittner \(2004, p. 276\)](#) assumes that “[o]ften, the reference of other elements in the sentence is restricted by this type of adverbial, such as the reference of *viele Leute* ‘many people’ to America”, see (7), or of other quantified DPs like *alle Leute* ‘all people’ to another particular region. For that reason, we used universally quantified phrases as subjects.

- (7) In Amerika essen viele Leute in Fastfood- Restaurants.  
*in America eat many people in Fast.food restaurants*  
 ‘In America, many people eat in fast food restaurants.’

Since the frame adverbials we used are local PPs – which might scramble (see, e.g., [Frey, 2003](#)) – we had to make sure that they were indeed interpreted as frame adverbials and not as event-external or event-internal local modifiers. For that reason experimental items were constructed as copula sentences. According to [Maienborn \(2001, p. 217\)](#), “external modifiers are only licensed if the verb provides an eventuality argument”. Since copula sentences do not introduce an event argument (see, e.g., [Maienborn, 2003](#)), it should not be possible for the local adverbial to be interpreted as an event-external or -internal modifier.

Four presentation lists were constructed by randomly combining the 24 experimental items with 116 filler sentences, counterbalanced across the four conditions. Each participant saw only one version of each item.

### 3.1.1.3 Procedure

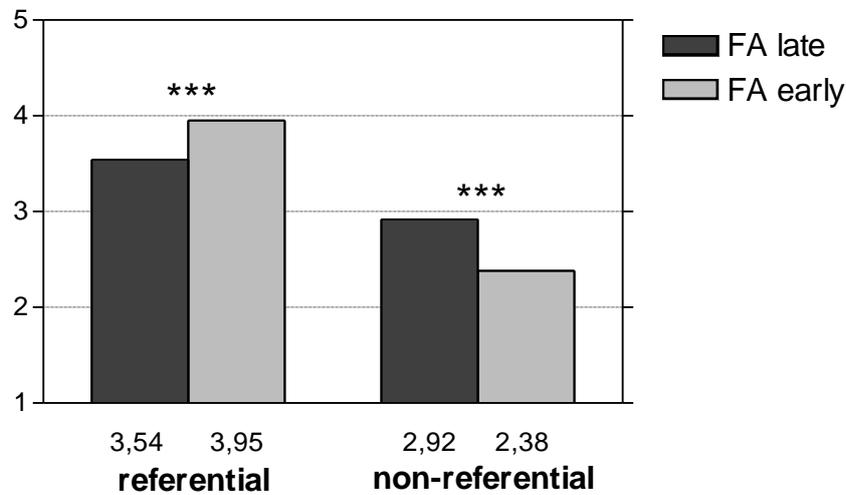
The experiment was run on a PC using E-Prime 2.0 software (Psychology Software Tools, Inc.).

After reading a sentence, participants were asked to rate its acceptability on a five-point scale (‘5’ = good, natural sentence, ‘1’ = unacceptable sentence).

<sup>1</sup> Base position approaches like [Frey and Pittner \(1998\)](#), [Frey \(2003\)](#) and [Pittner \(2004\)](#) assign evidential, epistemic and evaluative adverbials to the same syntactic class, namely sentence adverbials with possible semantic order preferences amongst them. Although there are authors who differentiate syntactically between different sentence adverbial types ([Lang, 1979](#); [Steube, 2006](#)), we agree with the view that these three types belong to the same syntactic class. Since evaluative sentence adverbials in earlier studies showed a somehow different behavior than epistemic and evidential sentence adverbials, we excluded this type from the present experiments.

### 3.1.2 Results

The results are presented in Figure 1.



**Figure 1:** Mean acceptability judgments for the four conditions on a five-point scale ('FA' = frame adverbial)

The mean acceptability judgments revealed a main effect of *referentiality* ( $F(1,63) = 216.235$ ,  $p_1 < .001$ ;  $F(1,23) = 296.023$ ,  $p_2 < .001$ ) that is due to the fact that the two referential conditions were judged better than the two non-referential ones. By contrast, there was no main effect of *position* ( $F(1,63) = 1.948$ ,  $p_1 = .168$ ;  $F(1,23) = .927$ ,  $p_2 = .346$ ). Additionally, an interaction of the two factors *referentiality* and *position* was found ( $F(1,63) = 64.879$ ,  $p_1 < .001$ ;  $F(1,23) = 69.998$ ,  $p_2 < .001$ ). It turned out that the sentences with a non-referential frame adverbial were judged significantly better if the frame adverbial followed a sentence adverbial rather than preceded it ( $F(1,63) = 51.221$ ,  $p_1 < .001$ ;  $F(1,23) = 46.262$ ,  $p_2 < .001$ ), whereas the referential ones were judged significantly better if the frame adverbial was preceding the sentence adverbial rather than following it ( $F(1,63) = 30.952$ ,  $p_1 < .001$ ;  $F(1,23) = 18.900$ ,  $p_2 < .001$ ).

## 3.2 Experiment 2: Self-paced reading experiment

### 3.2.1 Method

#### 3.2.1.1 Participants

In this study, 36 students of the University of Tübingen were tested. All participants were German native speakers and were paid for participation. Participants of Experiment 1 were excluded from the self-paced reading study.

#### 3.2.1.2 Materials

Sentence materials used in this study were the same as in Experiment 1. Again, four presentation lists were constructed in which the 24 experimental items were randomly combined with 48 filler sentences. They were counterbalanced across the four conditions so that each participant saw only one version of each item.

### 3.2.1.3 Procedure

The experiment was run on a PC using E-Prime 2.0 software (Psychology Software Tools, Inc.).

Sentences were divided into five regions which were presented in a self-paced mode with a moving window technique. Participants pressed the space bar of the keyboard to begin a trial, at which time a row of dashes appeared on the screen. Then, participants pressed the space bar to read each region of the sentence (see illustration in (8)).

(8) ---- ----, ---- ----- ---- ---- ---- ---- ---- ----  
 Eva meint, ---- ----- ---- ---- ---- ---- ---- ----  
 ---- ----, dass ----- ---- ---- ---- ---- ---- ----  
 ---- ----, ---- wahrscheinlich auf Mallorca ---- ---- ---- ----  
 ---- ----, ---- ---- ---- ---- ---- ---- alle Urlauber ---- ----  
 ---- ----, ---- ---- ---- ---- ---- ---- ---- ---- betrunken sind.

Participants were told to read the sentences at a natural pace. One third of the sentences was followed by a comprehension question.

### 3.2.1.4 Data Analysis

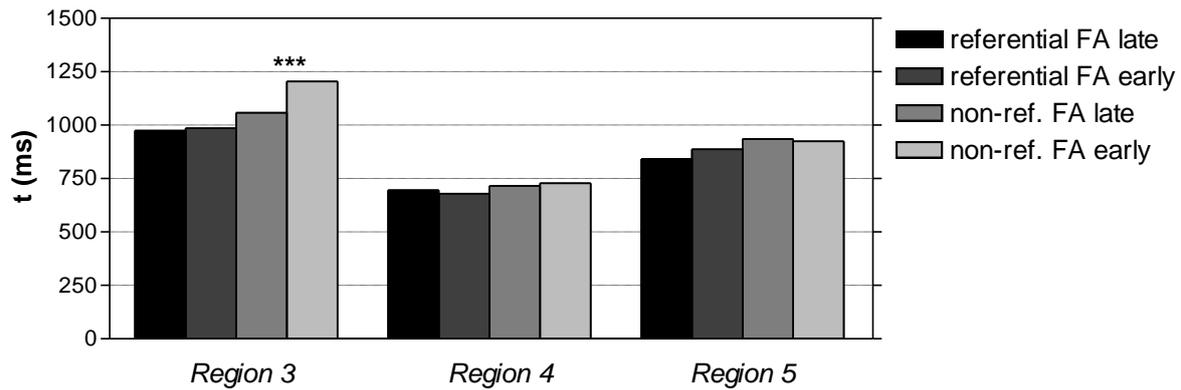
We analyzed participants' reading times for the five regions. To eliminate outliers from the analysis, we employed a two-step procedure: We first excluded reading times that were shorter than 50 ms or longer than 3000 ms for Region 1, longer than 2000 ms for Region 2, longer than 5000 ms for Region 3, longer than 3000 ms for Region 4 or longer than 5000 ms for Region 5. We also excluded reading times that were more than 2.5 *SD* from the mean per participant and condition. This led to less than 5 % data loss for the particular regions (3.59 % for Region 1; 4.72 % for Region 2; 2.55 % for Region 3; 3.01 % for Region 4; 4.17 % for Region 5). The remaining reading times were submitted to two separate ANOVAs for each region – one with an error term that was based on participant variability (*F1*) and one with an error term that was based on item variability (*F2*). Participants responded correctly to 98.96 % of the comprehension questions.

## 3.2.2 Results

In Region 1 and 2, no significant effects were found. The results for Region 3-5 are shown in Table 1 and Figure 2.

**Table 1:** Mean reading times in ms for the four conditions in the critical region 3 that contains the frame and sentence adverbial as well as in the two following regions ('FA' = frame adverbial, 'SA' = sentence adverbial)

	referential FA late	referential FA early	non-ref. FA late	non-ref. FA early
<b>Region 3: FA &amp; SA</b>	974,109	985,067	1058,229	1203,777
<b>Region 4: subject</b>	696,058	679,18	715,047	728,163
<b>Region 5: adjective &amp; copula</b>	841,584	886,258	935,454	924,704



**Figure 2:** Mean reading times in ms for the four different conditions in the critical region 3 that contains the frame and sentence adverbial and in the two following regions ('FA' = frame adverbial)

In the critical region 3 a main effect of *referentiality* was found ( $F_1(1,35) = 21.956$ ,  $p_1 < .001$ ;  $F_2(1,23) = 16.980$ ,  $p_2 < .001$ ): participants were faster in reading referential compared to non-referential conditions. In addition the analysis revealed a main effect of *position* that turned out to be fully significant by participants, but only marginally significant in the item analysis ( $F_1(1,35) = 7.279$ ,  $p_1 < .05$ ;  $F_2(1,23) = 3.125$ ,  $p_2 = .090$ ). Sentences with a late frame adverbial were read somewhat faster than sentences with an early frame adverbial. Finally, there was a significant interaction of the two factors *referentiality* and *position* ( $F_1(1,35) = 8.297$ ,  $p_1 < .01$ ;  $F_2(1,23) = 4.961$ ,  $p_2 < .05$ ): The conditions with non-referential frame adverbials showed a significant effect of *position* ( $F_1(1,35) = 13.582$ ,  $p_1 = .001$ ;  $F_2(1,23) = 6.727$ ,  $p_2 < .05$ ) – participants were faster reading sentences with a non-referential frame adverbial following the sentence adverbial. No significant difference was found in the referential conditions ( $F_1(1,35) = .068$ ,  $p_1 = .795$ ;  $F_2(1,23) = .116$ ,  $p_2 = .736$ ).

Reading times for regions 4 and 5 revealed a spill-over effect of *referentiality* with longer reading times for sentences with non-referential frame adverbials (Region 4:  $F_1(1,35) = 6.823$ ,  $p_1 < .05$ ;  $F_2(1,23) = 8.594$ ,  $p_2 < .01$ . Region 5:  $F_1(1,35) = 5.733$ ,  $p_1 < .05$ ;  $F_2(1,23) = 8.774$ ,  $p_2 < .01$ ). No other effects reached significance.

## 4 Discussion

The results of the two experiments can be summarized as follows. Using an acceptability judgment task in Experiment 1, we found a main effect of *referentiality*, but no main effect of *position*. Furthermore, an interaction of the two factors was observed. With a self-paced reading task in Experiment 2 a main effect of *referentiality* and a main effect of *position* (fully significant only in the analysis by participants) were found on the critical segment (frame and sentence adverbial). In addition, the interaction of the two factors was significant.

The main effect of *referentiality* in both experiments was due to the fact that conditions with non-referential frame adverbials were rated lower and read more slowly than the referential ones. In our materials the non-referential frame adverbials contained negated phrases like *auf keiner Insel* ('on no island') but referential frame adverbials like *auf Mallorca* ('on Majorca') did not. Processing negation is more costly for the sentence processor (see, e.g., [Lüdtke, Friedrich, De Filippis and Kaup, 2008](#)), which presumably led to slower reading times and lower ratings for the sentences with non-referential frame adverbials.

If we look at the descriptive data, the main effect of *position*, which was only found in Experiment 2 and was only significant in the analysis by participants, seems to be driven almost exclusively by the condition with a non-referential and late frame adverbial. This result, as well as the missing effect of *position* for the rating data, is evidence against Hypothesis (4) which, based on results for argument movement, predicted a penalty for moved constituents per se, independent of referentiality. It seems that the movement of adverbials causes no or at least not the same amount of processing costs compared to moved arguments.

We will now turn to the significant interaction of the two factors found in both experiments.

In the two non-referential conditions, an early frame adverbial was rated significantly lower and processed significantly slower than the late adverbial. This result can be interpreted as evidence for a frame adverbial's base position below sentence adverbials and therefore against the assumptions of [Frey and Pittner \(1998\)](#) and [Maienborn \(2001\)](#) who argue for a base position above sentence adverbials (see Hypothesis (2)).

For referential frame adverbials, the two experiments provide the following results: In the self-paced reading study there was no difference in processing times. This could be interpreted as evidence for [Frey's \(2003\)](#) account which assumes that referential frame adverbials can appear above or below sentence adverbials depending on their topical status. By contrast, the acceptability judgment task shows a clear preference for referential frame adverbials preceding sentence adverbials. This result could be interpreted in terms of an account assuming that referential frame adverbials obligatorily move to a position above sentence adverbials ([Steube, 2006](#) and [Pittner, 2004](#); see Hypothesis (3)).

So the open question remains: Why do referential frame adverbials behave differently in the self-paced reading and in the acceptability judgment study?

To find an answer, one could point to the different methods used in the two experiments. Self-paced reading measures sentence processing online whereas acceptability judgments are an offline method with measurement after the sentence has been fully processed. With this in mind a possible explanation could be the following: As [Frey \(2000, 2003, 2004\)](#) states, frame adverbials can be interpreted as topics, but they are not marked for topicality per se. The topicality of the frame adverbial is a factor that was not controlled in our two experiments. Putting aside the difficulty to interpret a frame adverbial as an aboutness topic (see section 2), topical status is definitely not determined in our materials.

One possible explanation would be to assume a two-stage model for adjunct processing. In a first step only syntactic information is considered. A second processing step also takes into account further information, i.e., pragmatic information like topicality. Therefore, in online word-by-word processing only syntactic information is considered. It does not play a role if the frame adverbial has the status of an aboutness topic or not. In contrast, this factor is relevant for offline processing, because here the whole proposition is available and the sentence is fully interpreted.

A possible explanation would then be that the results of the online study show no preference for one of the two adverbial orders, because in principle both are syntactically possible for a referential frame setter. But with measurement at the end of the sentence in the offline Experiment 1, participants had more time for processing and might have interpreted frame adverbials as topics, and therefore they prefer the position preceding sentence adverbials. A possibility to test this explanation will be sketched in the conclusion.

## 5 Conclusion and future research

The present study showed that the semantic factor *referentiality* plays an important role in positioning adverbials. Referential and non-referential frame adverbials occupy different positions relative to sentence adverbials.

For non-referential frame adverbials, we found a clear preference for the position following sentence adverbials. This result provides evidence for the assumption that frame adverbials are base generated below sentence adverbials.

For referential frame adverbials, on the other hand, the results are not that clear-cut. The online results suggest that this adverbial type can precede or follow sentence adverbials whereas the offline results revealed a preference for the position preceding sentence adverbials. Whether this offline preference is linked to topicality has to be clarified in further research. As a first step in this direction, we will conduct a further experiment in which the two conditions with referential frame adverbials are preceded by two different kinds of contexts. The first context marks the frame adverbial as topic, see (9a), whereas in the second context no topic marking takes place, see (9b).

- (9) a. Was sagt Eva über Mallorca?  
*what says Eva about Majorca*  
 ‘What does Eva say about Mallorca?’
- b. Was sagt Eva?  
*what says Eva*  
 ‘What does Eva say?’
- c. Eva meint, dass {auf Mallorca wahrscheinlich} alle Urlauber betrunken sind.  
*Eva thinks that {on Majorca probably} all tourists drunk are*  
 ‘Eva thinks that {on Majorca probably} all tourists are drunk.’

As we discussed above, frame setters restrict the speaker’s claim to a certain domain, whereas aboutness topics establish a referent the sentence is about or, in other words, provide the address with which new information is stored. We will try to combine these two concepts by either marking the DP within the frame adverbial as the aboutness topic or not.

If [Frey’s \(2003\)](#) assumption concerning the connection between a frame adverbial’s topical status and its position is right, we predict an interaction of context and position. Higher ratings and faster reading times are expected if the frame adverbial precedes the sentence adverbial in a context like (9a) compared to (9b). In contrast, higher ratings and faster reading times should be observed if the frame adverbial follows the sentence adverbial in a context like (9b) compared to (9a).

All in all, our results revealed initial support for a base position account of frame adverbials. Furthermore, we provided evidence that the referentiality of the frame setter is crucial to its positioning. Further research will show how this factor is connected to topicality.

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## Appendix

### Sentence Materials

1.
  - 1a.** Nina berichtet, dass wahrscheinlich in Paris alle Touristen verliebt sind.
  - 1b.** Nina berichtet, dass in Paris wahrscheinlich alle Touristen verliebt sind.
  - 1c.** Nina berichtet, dass wahrscheinlich in keiner Stadt alle Touristen verliebt sind.
  - 1d.** Nina berichtet, dass in keiner Stadt wahrscheinlich alle Touristen verliebt sind.
2.
  - 2a.** Clara sagt, dass angeblich in Deutschland alle Fußballspieler gedopt sind.
  - 2b.** Clara sagt, dass in Deutschland angeblich alle Fußballspieler gedopt sind.
  - 2c.** Clara sagt, dass angeblich in keinem Land alle Fußballspieler gedopt sind.
  - 2d.** Clara sagt, dass in keinem Land angeblich alle Fußballspieler gedopt sind.
3.
  - 3a.** Anna meint, dass offenbar in den USA alle Taxifahrer übergewichtig sind.
  - 3b.** Anna meint, dass in den USA offenbar alle Taxifahrer übergewichtig sind.
  - 3c.** Anna meint, dass offenbar in keinem Staat alle Taxifahrer übergewichtig sind.
  - 3d.** Anna meint, dass in keinem Staat offenbar alle Taxifahrer übergewichtig sind.
4.
  - 4a.** Sonja sagt, dass möglicherweise in Brandenburg jede Diskothek rauchfrei ist.
  - 4b.** Sonja sagt, dass in Brandenburg möglicherweise jede Diskothek rauchfrei ist.
  - 4c.** Sonja sagt, dass möglicherweise in keinem Bundesland jede Diskothek rauchfrei ist.
  - 4d.** Sonja sagt, dass in keinem Bundesland möglicherweise jede Diskothek rauchfrei ist.
5.
  - 5a.** Tanja erzählt, dass angeblich in Kirchentellinsfurt alle Einwohner über 50 Jahre alt sind.
  - 5b.** Tanja erzählt, dass in Kirchentellinsfurt angeblich alle Einwohner über 50 Jahre alt sind.
  - 5c.** Tanja erzählt, dass angeblich in keinem Dorf alle Einwohner über 50 Jahre alt sind.
  - 5d.** Tanja erzählt, dass in keinem Dorf angeblich alle Einwohner über 50 Jahre alt sind.
6.
  - 6a.** Jana sagt, dass möglicherweise auf dem Mount Everest jeder Weg gekennzeichnet ist.
  - 6b.** Jana sagt, dass auf dem Mount Everest möglicherweise jeder Weg gekennzeichnet ist.
  - 6c.** Jana sagt, dass möglicherweise auf keinem Berg jeder Weg gekennzeichnet ist.
  - 6d.** Jana sagt, dass auf keinem Berg möglicherweise jeder Weg gekennzeichnet ist.
7.
  - 7a.** Anja meint, dass tatsächlich in der Sahara alle Bewohner Nomaden sind.
  - 7b.** Anja meint, dass in der Sahara tatsächlich alle Bewohner Nomaden sind.
  - 7c.** Anja meint, dass tatsächlich in keiner Wüste alle Bewohner Nomaden sind.
  - 7d.** Anja meint, dass in keiner Wüste tatsächlich alle Bewohner Nomaden sind.
8.
  - 8a.** Britta sagt, dass offenbar in den Tropen alle Insekten giftig sind.
  - 8b.** Britta sagt, dass in den Tropen offenbar alle Insekten giftig sind.
  - 8c.** Britta sagt, dass offenbar in keiner Klimazone alle Insekten giftig sind.
  - 8d.** Britta sagt, dass in keiner Klimazone offenbar alle Insekten giftig sind.
9.
  - 9a.** Laura berichtet, dass anscheinend im Elsass jeder Flammkuchen handgemacht ist.
  - 9b.** Laura berichtet, dass im Elsass anscheinend jeder Flammkuchen handgemacht ist.
  - 9c.** Laura berichtet, dass anscheinend in keiner Region jeder Flammkuchen handgemacht ist.
  - 9d.** Laura berichtet, dass in keiner Region anscheinend jeder Flammkuchen handgemacht ist.
10.
  - 10a.** Eva meint, dass wahrscheinlich auf Mallorca alle Urlauber betrunken sind.
  - 10b.** Eva meint, dass auf Mallorca wahrscheinlich alle Urlauber betrunken sind.

**10c.** Eva meint, dass wahrscheinlich auf keiner Insel alle Urlauber betrunken sind.

**10d.** Eva meint, dass auf keiner Insel wahrscheinlich alle Urlauber betrunken sind.

11.

**11a.** Maria meint, dass wahrscheinlich im Kölner Dom jeder Besucher andächtig ist.

**11b.** Maria meint, dass im Kölner Dom wahrscheinlich jeder Besucher andächtig ist.

**11c.** Maria meint, dass wahrscheinlich in keiner Kirche jeder Besucher andächtig ist.

**11d.** Maria meint, dass in keiner Kirche wahrscheinlich jeder Besucher andächtig ist.

12.

**12a.** Clara berichtet, dass tatsächlich am Bodensee jeder Camper zufrieden ist.

**12b.** Clara berichtet, dass am Bodensee tatsächlich jeder Camper zufrieden ist.

**12c.** Clara berichtet, dass tatsächlich an keinem See jeder Camper zufrieden ist.

**12d.** Clara berichtet, dass an keinem See tatsächlich jeder Camper zufrieden ist.

13.

**13a.** Paula erwähnt, dass möglicherweise in Berlin alle Bürger glücklich sind.

**13b.** Paula erwähnt, dass in Berlin möglicherweise alle Bürger glücklich sind.

**13c.** Paula erwähnt, dass möglicherweise in keiner Stadt alle Bürger glücklich sind.

**13d.** Paula erwähnt, dass in keiner Stadt möglicherweise alle Bürger glücklich sind.

14.

**14a.** Petra berichtet, dass anscheinend in Spanien alle Schiedsrichter korrupt sind.

**14b.** Petra berichtet, dass in Spanien anscheinend alle Schiedsrichter korrupt sind.

**14c.** Petra berichtet, dass anscheinend in keinem Land alle Schiedsrichter korrupt sind.

**14d.** Petra berichtet, dass in keinem Land anscheinend alle Schiedsrichter korrupt sind.

15.

**15a.** Sarah erwähnt, dass sicherlich in Nigeria alle Politiker bestechlich sind.

**15b.** Sarah erwähnt, dass in Nigeria sicherlich alle Politiker bestechlich sind.

**15c.** Sarah erwähnt, dass sicherlich in keinem Staat alle Politiker bestechlich sind.

**15d.** Sarah erwähnt, dass in keinem Staat sicherlich alle Politiker bestechlich sind.

16.

**16a.** Maria meint, dass sicherlich in Baden-Württemberg alle Demonstranten aufgebracht sind.

**16b.** Maria meint, dass in Baden-Württemberg sicherlich alle Demonstranten aufgebracht sind.

**16c.** Maria meint, dass sicherlich in keinem Bundesland alle Demonstranten aufgebracht sind.

**16d.** Maria meint, dass in keinem Bundesland sicherlich alle Demonstranten aufgebracht sind.

17.

**17a.** Pia erwähnt, dass anscheinend in Hirschau alle Einheimischen katholisch sind.

**17b.** Pia erwähnt, dass in Hirschau anscheinend alle Einheimischen katholisch sind.

**17c.** Pia erwähnt, dass anscheinend in keinem Dorf alle Einheimischen katholisch sind.

**17d.** Pia erwähnt, dass in keinem Dorf anscheinend alle Einheimischen katholisch sind.

18.

**18a.** Helga erwähnt, dass angeblich am Matterhorn alle Abhänge steil sind.

**18b.** Helga erwähnt, dass am Matterhorn angeblich alle Abhänge steil sind.

**18c.** Helga erwähnt, dass angeblich an keinem Berg alle Abhänge steil sind.

**18d.** Helga erwähnt, dass an keinem Berg angeblich alle Abhänge steil sind.

19.

**19a.** Julia meint, dass offenbar in der Wüste Gobi alle Tiere Überlebenskünstler sind.

**19b.** Julia meint, dass in der Wüste Gobi offenbar alle Tiere Überlebenskünstler sind.

**19c.** Julia meint, dass offenbar in keiner Wüste alle Tiere Überlebenskünstler sind.

**19d.** Julia meint, dass in keiner Wüste offenbar alle Tiere Überlebenskünstler sind.

20.

**20a.** Frida erwähnt, dass vermutlich in der Tundra jeder Winter endlos ist.

**20b.** Frida erwähnt, dass in der Tundra vermutlich jeder Winter endlos ist.

**20c.** Frida erwähnt, dass vermutlich in keiner Klimazone jeder Winter endlos ist.

**20d.** Frida erwähnt, dass in keiner Klimazone vermutlich jeder Winter endlos ist.

21.

**21a.** Rita erwähnt, dass tatsächlich im Schwarzwald alle Wanderer gutgelaunt sind.

**21b.** Rita erwähnt, dass im Schwarzwald tatsächlich alle Wanderer gutgelaunt sind.

**21c.** Rita erwähnt, dass tatsächlich in keiner Region alle Wanderer gutgelaunt sind.

**21d.** Rita erwähnt, dass in keiner Region tatsächlich alle Wanderer gutgelaunt sind.

22.

**22a.** Lisa erzählt, dass vermutlich auf Sylt alle Bewohner wohlhabend sind.

**22b.** Lisa erzählt, dass auf Sylt vermutlich alle Bewohner wohlhabend sind.

**22c.** Lisa erzählt, dass vermutlich auf keiner Insel alle Bewohner wohlhabend sind.

**22d.** Lisa erzählt, dass auf keiner Insel vermutlich alle Bewohner wohlhabend sind.

23.

**23a.** Paula berichtet, dass vermutlich im Ulmer Münster alle Fenster dicht sind.

**23b.** Paula berichtet, dass im Ulmer Münster vermutlich alle Fenster dicht sind.

**23c.** Paula berichtet, dass vermutlich in keiner Kirche alle Fenster dicht sind.

**23d.** Paula berichtet, dass in keiner Kirche vermutlich alle Fenster dicht sind.

24.

**24a.** Anna sagt, dass sicherlich im Victoria-See alle Fische krank sind.

**24b.** Anna sagt, dass im Victoria-See sicherlich alle Fische krank sind.

**24c.** Anna sagt, dass sicherlich in keinem See alle Fische krank sind.

**24d.** Anna sagt, dass in keinem See sicherlich alle Fische krank sind.