

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

How pitch accents and focus particles affect the recognition of contextual alternatives

Permalink

<https://escholarship.org/uc/item/7pg8g2wq>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 35(35)

ISSN

1069-7977

Authors

Gotzner, Nicole
Spalek, Katharina
Wartenburger, Isabell

Publication Date

2013

Peer reviewed

How pitch accents and focus particles affect the recognition of contextual alternatives

Nicole Gotzner (nicole.gotzner@hu-berlin.de)

Katharina Spalek (katharina.spalek@staff.hu-berlin.de)

Department of German Language and Linguistics, Humboldt-Universität zu Berlin,
Dorotheenstr. 24, 10117 Berlin, Germany

Isabell Wartenburger (isabell.wartenburger@uni-potsdam.de)

Department of Linguistics, Universität Potsdam
Karl-Liebknecht-Str. 24-25, 14476 Potsdam, Germany

Abstract

Listeners are sensitive to contrastive alternatives in online language comprehension (e.g., Braun & Tagliapietra, 2010). Such alternatives play a crucial role in the definition of particles like *only* which have been found (i) to facilitate recall of contextual alternatives (Spalek, et al., in revision) and (ii) to hamper the rejection of unmentioned alternatives (Gotzner et al., in preparation). The present study investigated the impact of combining a contrastive accent with a particle on memory for contextual alternatives. The results revealed that L+H* accents (contrastive) facilitate recognition of a contextual alternative to the accented item compared with H* accents (non-contrastive). Adding either the particle *only* or *also* to the L+H* accent slows probe recognition relative to a condition with bare L+H* accent. Hence, while contrastive accenting directly increases the salience of alternatives in a listener's mental model, focus particles lead to an initial processing cost.

Keywords: contrastive alternatives, L+H* pitch accent, focus particles, recognition memory.

Introduction

Certain pitch accents convey the information that a statement is contrastive (cf. Pierrehumbert & Hirschberg, 1990). For example, when uttering the sentence *Mary passed the exam* with a specific intonation contour on the noun *Mary* (L+H* according to the ToBI system), a speaker expresses that Mary passed the exam in contrast to other persons in the discourse.

There is evidence that contrastive intonation contours lead to the activation of alternative expressions to the contrastively-stressed elements. For example, Braun and Tagliapietra (2010) found that a sentence produced with an L+H* accent on the critical word initiated priming of contrastively-related targets to the critical words in a lexical decision task (e.g., *ANTENNA* facilitated *satellite*).

There is also evidence that prosody influences long-term memory for contextual alternatives. Fraundorf, Watson and Benjamin (2010) compared contrastive (L+H*) and non-contrastive (H*) pitch accents in discourses that contained a contrast set with two elements. After exposure to all stimuli, participants had to perform a recognition memory task. The results revealed that the L+H* accent increased both the number of hits to correct statements, and the number of correct rejections of the

contrast item, suggesting that contrastive pitch accents enhance memory for the accented element itself as well as for its alternatives. The rejection of unmentioned items (lures), however, was not affected by the pitch accent manipulation.

According to the contrast representation account advocated by Fraundorf et al. (2010) listeners use contrastive accents to encode additional information about items in the contrast set. So, on this account, processing our example sentence *Mary passed the exam* with an L+H* accent would encourage the inference that other students did not pass the exam.

Focus Particles

Another means of expressing such a contrast is provided by certain lexical items. Placing the focus particle *only* in front of the utterance (*Only* *Mary passed the exam*) results in a similar effect, since the particle expresses that the focused element *Mary* but not the alternatives lead to a true assertion (cf. König, 1991).

In a previous delayed recall study (Spalek, Gotzner & Wartenburger, in revision), we explored the impact of focus particles on memory for contextual alternatives. We exposed participants to dialogs that introduced a set of three elements and either contained the particle *only*, *even* or no particle (control condition) in the critical sentences. The pitch accent type on the element mentioned in the critical sentences, the focused element, was constant across conditions (H* on the accented syllable). The results showed that memory for the alternatives to the focused element improved in the presence of the particles *only* and *even* relative to the control condition.

In a subsequent study (Gotzner, Spalek & Wartenburger, submitted), we tested the effects of focus particles on the recognition of contextual alternatives and rejection of unmentioned alternatives after exposure to an item. We found that participants were slower in rejecting unmentioned alternatives to a focused expression in case the utterances contained the particles *only*, *even* or *also*. This inhibitory effect was present when we enumerated a set of alternatives in the context and when the stimuli only mentioned a semantic category. We concluded that focus particles encourage richer encoding of the alternative set

which leads to better recall of the mentioned alternatives particle when tested at a longer delay (cf. Spalek et al., in revision).

Apart from the fact that focus particles and pitch accents belong to a different formal linguistic level, the two have a different impact on the status of inferences about the alternatives, according to linguistic theory (see for example Krifka, 2007 for an overview). The exhaustivity inference (that the statement does not hold for the alternatives) drawn from a contrastive accent is an implicature which arises through pragmatic reasoning. By definition, implicatures are cancellable inferences and it follows that an utterance with an L+H* accent has a reading that does not exclude the alternatives. On the contrary, the exclusion of alternatives is part of the conventional meaning of *only*, i.e. lexically encoded (cf. Rooth, 1992). In accordance with these theoretical distinctions, experimental work has shown that German participants draw fewer exhaustive inferences from sentences that bear intonational focus than from sentences with *only* (cf. Onea & Beaver, 2011).¹

In contrast to exclusive particles, additive particles like *also* and *even* presuppose that a statement holds for at least one of the alternatives and express that the proposition holds for the focused element as well (cf. König, 1991). Yet this linguistic difference did not affect the retrieval of alternatives in the experiments we carried out so far. Therefore, we concluded that the observed effects were driven by the fact that focus particles must refer to a set of alternatives by their semantic definition.

To sum up, there is evidence that focus particles facilitate recall of contextual alternatives (Spalek et al., in revision) and hamper the rejection of unmentioned alternatives when the focused element carries an unmarked accent (Gotzner et al., in preparation). Contrastive pitch accents lead to the activation of contextual alternatives (cf. Braun & Tagliapietra, 2010) and have been found to facilitate long-term memory for focused elements and contextual alternatives, but not for unmentioned items (cf. Fraundorf et al., 2010).

The Current Experiment

The aim of the current study was to investigate whether focus particles and contrastive pitch accents rely on the same cognitive mechanism and whether combining the two induces additive effects. That is, if the presence of alternatives is indicated by a contrastive pitch accent in addition to a focus particle, does the accessibility of contextual alternatives increase even further?

In non-tonal languages like English and German focus can be marked prosodically and by specific lexical and syntactic structures (cf. Krifka, 2008) while the different types of focus marking are not mutually exclusive. Following the proposal in Calhoun (2009), we assume

that by choosing a particular structure, the speaker wishes to make the alternatives particularly salient for the hearer. Hence, it might be that highlighting the alternatives from multiple sources leads to additive effects.

Participants in our experiment were presented with short discourses that mentioned two referents and one of them was mentioned again in the second critical sentence, either pronounced with (a) an unmarked accent (H*) or (b) a contrastive one (L+H*). In addition to the L+H* accent, condition (c) contained the exclusive particle *only* and (d) the inclusive particle *also*. After exposure to the stimuli, participants were asked to recognize the alternative to the noun mentioned in the critical sentences (not the mentioned noun itself).

Additionally, we introduced a delay manipulation that was based on a study by Glenberg, Meyer and Lindem (1987). In their experiment, they found that manipulating the associatedness of a referent and an object affected the mental model listeners constructed from a discourse only after a delay of one filler sentence but not if no filler sentence was presented before test. Since we were not interested in priming effects (cf. Braun & Tagliapietra, 2010), but in the participants' mental model representation of the contrast set, we administered a similar probe recognition task with a delay manipulation like Glenberg et al. (1987). Accordingly, we hypothesized that the effects only unfold if probe recognition is tested at a delay of one filler sentence.

We predicted that the L+H* accent will facilitate recognition of contextual alternatives compared to the H* accent. Concerning the comparison between the L+H* condition and the particle conditions there are three alternative predictions: If accenting and particles rely on the same cognitive mechanism, we should obtain the same magnitude and time-course of the effects. If, however, contrastive accenting and particles are additive, we expect that participants are fastest at recognizing the focus alternative in the two conditions with particles (i.e., (c) and (d)) since they contain a particle in addition to the contrastive accent. Alternatively, it might be that pitch accents are used immediately to encode information about the alternatives (see for example Watson et al., 2008) while such effects take more time to unfold in the case of focus particles. According to this hypothesis, we expect the L+H* accent to facilitate the recognition of alternatives after one intervening filler sentence whereas the particles should not cause any positive effects at this point of time.

Methods

Participants

A total of 24 native speakers of German (15 female and 9 male, mean age 26.1 years, age range 22-30) were recruited from a participant pool at the Institute of Psychology of Humboldt University and were paid 7

¹ Note, however, that accent type (contrastive vs. unmarked) was not manipulated in this study.

Euros in compensation. None of them reported any vision or hearing difficulties.

Materials

We created 80 discourses that followed the structure of the example presented in (1). The first sentence introduced two referent nouns. The second critical sentence mentioned one of the referents again and described an action. As described above, we introduced a delay variable: On 50 percent of the trials, an additional filler sentence (in brackets in the example) was presented. The filler sentence always consisted of five words and contained a pronoun keeping the referent foregrounded (cf. Glenberg et al., 1987). Across stimuli, the order of mention of the two referents was counterbalanced.

- (1) Der Richter und der Zeuge verfolgten die Beweisführung. (Nur/Auch) der RICHTER/der Richter glaubte dem Angeklagten. (Er verkündete das Urteil.)

Approximate translation:
The judge and the witness followed the argument. (Only/also²) the JUDGE/the judge believed the defendant. (He announced the verdict.)

The critical sentences were recorded in four versions in each of the conditions (H*, L+H*, *only* and *also*) by a female research assistant who was trained on focus accentuation and had a middle German accent close to the standard variety of German. After recording, the utterance with the L+H* accent (b) was cross-spliced into the two utterances with *only* (c) and *also* (d). Thereby, conditions (b), (c) and (d) all contained the L+H* accent and all prosodic characteristics of the sentences were held constant. In total, there were 8 experimental conditions: 4 focus conditions crossed with the delay of either 0 or 1 filler sentence.

Acoustic analyses were performed to compare the accented syllable of the H* (a) and L+H* (b) conditions. Figure 1 shows the pitch contour of the accented syllable averaged over all items. Additionally, acoustic analyses were performed to compare the duration, maximum pitch, pitch difference and intensity across accent type condition. Table 1 summarizes the means, standard deviations and results of repeated measures ANOVAs (within item) comparing these acoustic parameters. The analyses revealed that the syllable with L+H* accent had a higher pitch excursion, a greater pitch difference, intensity and duration.

The critical trials always probed recognition of the alternative to the noun in subject position, hence requiring

a yes response³. A set of 50 filler items was constructed and 60 items from another experiment were added to counterbalance yes- and no-responses and to prevent subjects from concentrating on the nouns in subject position. Half of the filler items consisted of 2 sentences and half of them consisted of 3 sentences.

Figure 1: Mean pitch contour of the accented syllable across H* and L+H* conditions.

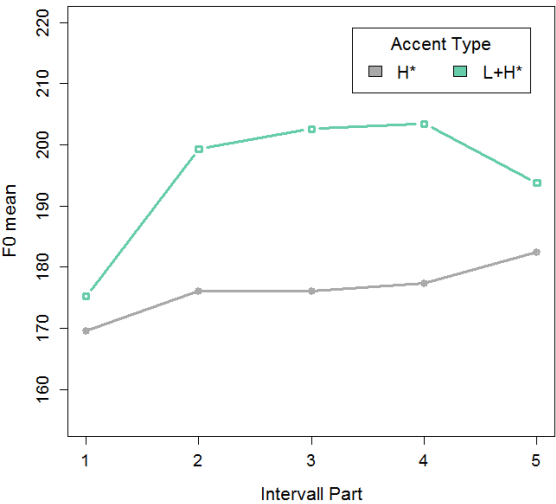


Table 1: Summary of acoustic analyses. Table shows mean values (SE) by accent type and results of F-tests.

Parameter	H	L+H*	<i>F</i> _(1,79)	<i>p</i> -value
<i>Duration (s)</i>	0.17 (0.01)	0.23 (0.01)	129.1	0.001
<i>Maximum Pitch (Hz)</i>	195.1 (4.5)	226.9 (6.2)	19.7	0.001
<i>Pitch difference (Hz)</i>	33.6 (4.5)	56.3 (6.2)	8.5	0.005
<i>Intensity (dB)</i>	69.1 (1.9)	73.3 (2.2)	208.0	0.001

Eight experimental lists were created by rotating through the focus (H*, L+H*, *only* and *also*) and delay conditions (0 vs. 1 filler sentence) according to a Latin square design. Hence, there were 10 items per condition within a given list. Each list further contained the 110 filler items resulting in a total of 190 items. The lists were pseudo-randomized for each participant so that no more than three filler or test trials were presented in a row and a given focus condition appeared only twice in a row.

² The German translation equivalent of the sentences is felicitous even though *also* in the English example cannot occur in this syntactic position.

³ In our previous experiments, we tested the alternatives to the elements in object position. Yet Fraundorf et al. (2010) did not find any differences in the effects across syntactic position (subject vs. object).

Procedure

The experiment started with an instruction displayed on the computer screen. The instructions told the participants that they will be presented with auditory stimuli and that their task is to decide whether a subsequently presented word had appeared in the story or not. They were also asked to respond as accurately and as quickly as possible and to listen to the exact wording. After the instructions were displayed, participants performed four practice trials and were allowed to adjust the sound volume.

Each trial began with the onset of a central fixation cross displayed for 700 ms followed by a discourse that was presented over headphones. Each of the sound files included 2000 ms of silence after the last sentence. On 50 percent of the trials, the audio files contained an additional filler sentence. Probes appeared after the entire audio files, that is, either after the critical sentence (50%, delay 0) or after the filler sentence (50%, delay 1).

Each probe was administered visually with an offset of 50 ms and the participants indicated whether it had appeared in the discourse by button press. The probe word stayed on the screen until a response was made. If subjects did not respond within a time frame of 4000 ms, the trial counted as a miss. With an offset of 500 ms the next trial was initiated. Every 33 trials, subjects had a short break. In total, there were 6 experimental blocks. The entire experiment lasted about 50 minutes.

Results

Trials in which subjects responded incorrectly (5.9 %) or that were more than 2 standard deviations from a participants' mean reaction time (4.9 %) were excluded from the analysis. Accuracy was similar across conditions. The log-RTs were analyzed with a series of mixed models following the procedure described in Baayen (2008). Since we had different predictions for the two delay conditions, we fit two separate models for the two data sets.

Figure 2 shows the mean RTs and standard errors across focus conditions at 0 delay. The final statistical model contained the log-RTs, focus condition and trial as fixed factors, subjects, items as random factors and random slopes for trial. We chose the condition with the L+H* accent as reference level, since the two conditions with particles contained an L+H* accent as well and since we were interested in whether the particles caused effects in addition to the contrastive accent. The final model had a log likelihood of 222.6 with 828 observations (27 further observations were excluded based on the distribution of residuals and fitted values). Regarding the focus conditions, the model did not reveal any reliable differences across conditions ($p > .2$; see Table 2 for model details). This is in line with Glenberg et al. (1987) who argued that effects of foregrounding in a mental model should only be observable after a delay of 1 filler sentence.

Figure 2: Mean RT across conditions (delay 0). Error bars indicate standard errors.

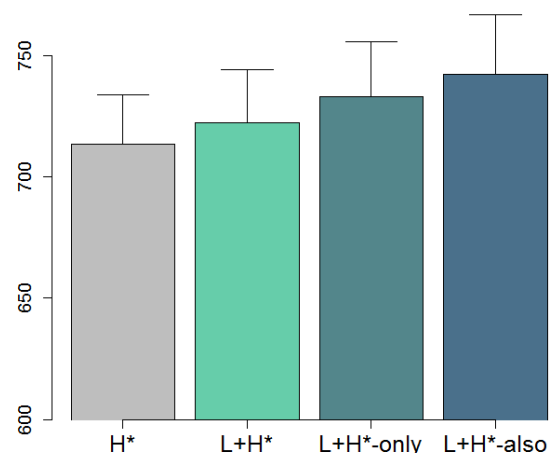


Figure 3 displays the mean RTs broken by focus condition at delay 1. The final mixed effects model for this data set contained the same factors and it had a log likelihood of 206.1 (803 observations, 27 excluded). The analysis revealed that the alternatives were recognized slower in the condition with H* accent in comparison with the L+H* accent ($t=2.8$, $SE=.03$, $p<.01$). Hence, the L+H* accent facilitated recognition of the alternatives. Compared to the condition with L+H* accent, the two particles *only* and *also* led to an inhibitory effect (L+H* vs. *only*: $t=2.0$, $SE=.03$, $p<.05$; L+H* vs. *also*: $t=2.5$, $SE=.03$, $p<.05$). Thus, adding a focus particle to the contrastive pitch accent led to slower probe recognition times. Table 3 summarizes estimates, confidence intervals and p -values extracted by Markov chain Monte Carlo sampling (10000 runs).

Figure 3: Mean RT across conditions (delay 1). Error bars indicate standard errors.

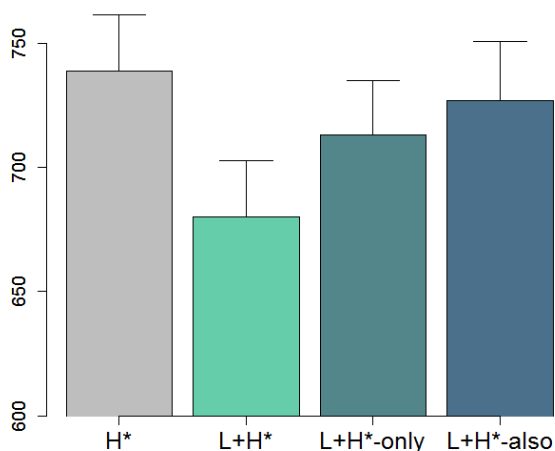


Table 2: Summary of the mixed model (at delay 0).

	Estimate	Lower bound	Upper bound	pMCMC
Intercept (L+H*)	6.47	6.37	6.56	0.0001
H*	0.04	-0.02	0.09	0.18
only	0.002	-0.05	0.06	0.94
also	0.01	-0.04	0.07	0.72
Trial	-0.002	-0.003	-0.0015	0.0001

Table 3: Summary of the mixed model (at delay 1).

	Estimate	Lower bound	Upper bound	pMCMC
Intercept (L+H*)	6.39	6.3	6.49	0.0001
H*	0.08	0.03	0.14	0.006
only	0.06	-0.002	0.11	0.05
also	0.07	0.01	0.13	0.02
Trial	-0.01	-0.004	-0.002	0.0001

Discussion

The study reported here extends earlier findings on the role of pitch accents in the retrieval of contextual alternatives in two ways. First, it indicates that the L+H* accent not only induces priming or activation of contrastive alternatives (cf. Braun & Tagliapietra, 2010) but it also benefits recognition memory for contextual alternatives. Second, it shows that such effects already unfold after one intervening filler sentence (in comparison with the long delay introduced by Fraundorf et al., 2010).

The task we used required participants to construct a mental model from the auditory discourses they were presented with and they had to recognize a referent that was an alternative to the element mentioned in the critical sentences. In accordance with Glenberg et al. (1987), the effects we observed only evolved after the inclusion of one filler sentence. This finding also provides evidence that there were no general processing differences across conditions. For example, it might be argued that the conditions with particles contained one more word compared to the other conditions leading to increased processing times. However, we would expect to see the same differences across conditions at 0 delay if this were the right explanation of the effects.

Looking at the recognition times in the H* and L+H* conditions across delays, it becomes obvious that recognition performance was equal at 0 delay. By comparison, the H* slowed and the L+H* facilitated recognition times at delay 1. This pattern of results is in line with a recent study by Husband & Ferreira (2012). They found that contrastively-stressed as well as neutral prime words primed contrastive targets at an immediate SOA. At a longer SOA, the contrastive associates only

maintained facilitation in the condition with L+H* accent. Hence, it seems that initially the activation of contrastive alternatives does not differ across H* and L+H* conditions. At a delay of one filler sentence in our experiment, activation of the alternatives decays in the H* case (as was also argued by Husband & Ferreira, 2012) and augments in the L+H* case.

This pattern of results confirms the assumption by Watson et al. (2008) that the interpretational domains of the two accent types overlap to some extent in that H* are compatible with contrastive and non-contrastive referents but that L+H* favor contrastive referents. The data are hence in line with the claim that H* and L+H* accent do not necessarily form two discrete categories but that the latter is the more contrastive variant of the former.

The L+H* pitch accent made the contrastive alternative more accessible at a delay of one filler sentence. In contrast, adding either an exclusive or inclusive particle led to a processing cost. It is conceivable that the observed pattern is due to a facilitatory effect by the contrastive accent combined with an inhibitory effect of the particles since the conditions with particles contained exactly the same (cross-spliced) recorded utterance.

Such inhibitory effects are consistent with the results of our probe recognition experiments where we found that participants were slower in rejecting unmentioned alternatives to a focused expression in case the utterances contained the particles *only*, *even* or *also* (vs. no particle). This inhibitory effect even showed when we explicitly introduced a set of three elements. Hence, we concluded that the particles led to the activation of further unmentioned alternatives in a listener's mental model slowing the participant's ability to indicate that these elements had not appeared in the story.

Interestingly, Fraundorf et al. (2010) did not find any effects of contrastive pitch accents on the rejection of unmentioned items (so-called lures). Despite the differences between the experiments, it might be that contrastive accents only affect the representation of items in the explicit contrast set while focus particles lead to the retrieval of further alternatives accounting for the inhibitory effects observed here (as well as in Gotzner et al., in preparation).

In conclusion, it seems that focus particles lead to an initial processing cost. The positive effect on the retrieval of contextual alternatives that we have observed in our delayed recall experiments (Spalek et al., in revision) seems to need time to develop. By contrast, pitch accents are used immediately by a listener to encode information about the alternatives (see also Watson et al., 2008 for a similar argument). Yet further research is needed to establish whether focus particles and contrastive pitch accents cause additive effects at longer delays or whether the effects level out. It should also be noted that the different experimental paradigms, probe recognition and delayed recall, impose quite different task demands.

Concerning the theoretical account of the observed effects, the comparison between the different types of focus particles leads to an interesting conclusion. Following the original formulation of the contrast representation account, we should expect the particle *only* to pattern along with contrastive accents but not the particle *also* since Fraundorf et al. (2010) speculate that contrastive accents create a representation of what did **not** happen. However, across all our experiments we found that both exclusive (associated with an exhaustive meaning) and additive particles affected memory for information-structural alternatives to a similar extent. Additive particles like *also* do not have an exhaustive meaning but they presuppose that a statement holds for at least one alternative. Yet what exclusive and additive particles have in common is that both require a salient set of alternatives.

In light of the findings, we propose a modification of the contrast representation account: We assume that focus-sensitive particles (and contrastive accents) make reference to an alternative set and highlight its relevance for interpretation (see also Krifka, 2007 for a recent definition of focus). This creates a salient representation of the alternatives and makes them more easily retrievable on the long run. In immediate recognition (after one intervening filler sentence), adding a particle to a contrastive accent hampers the participants' ability to match a probe with the alternatives encoded in the mental model, as observed in the present experiment.

The fact that the facilitatory effects of contrastive accenting already unfolded after one intervening sentence whereas the particles led to a processing cost at this point of time could either indicate that the underlying cognitive mechanisms are different in the two domains or simply that prosody is integrated at an earlier point of time. However, further research is required to determine the exact cognitive mechanisms that underlie the observed effects. Taken together with the results of Gotzner et al. (submitted), the inhibitory effects of the particles might indicate that listeners activate further unmentioned items interfering with the recognition of the explicitly-introduced alternatives. Such effects might be absent in the case of contrastive accents considering the results of Fraundorf et al. (2010).

Conclusion

We showed that contrastive pitch accents enhance the recognition of contextual alternatives after auditory exposure to an item. The combination of a contrastive pitch accent and a focus particle, in turn, led to an inhibitory effect. We therefore suggest that the facilitatory effects of focus particles on the retrieval of contextual alternatives (cf. Spalek et al., 2013) take time to develop.

Acknowledgments

This work was supported by the DFG as part of the Collaborative Research Centre SFB 623 "Information

Structure". Isabell Wartenburger is supported by the Stifterverband für deutsche Wissenschaft (Claussen-Simon-Stiftung). We thank Janine Klose and Vinzent Müller for carrying out the experiments and assistance with sound recording. We are also grateful to two anonymous reviewers for helpful comments.

References

- Baayen, R. H. (2008) *Analyzing Linguistic Data. A Practical Introduction to Statistics Using R*. Cambridge University Press.
- Braun, B., & Tagliapietra, L. (2010). The role of contrastive intonation contours in the retrieval of contextual alternatives. *Language and Cognitive Processes*, 25, 1024-1043.
- Calhoun, S. (2009). What makes a word contrastive? Prosodic, Semantic and Pragmatic Perspectives. In D. Barth-Weingarten, N. Dehé and A. Wichmann (eds.) *Where prosody meets pragmatics: Research at the interface* (Studies in Pragmatics 8, 53-78), Bingley.
- Fraundorf, S.H., Watson, D.G. & Benjamin, A.S. (2010). Recognition Memory reveals just how CONTRASTIVE contrastive accenting really is. *Journal of Memory and Language*, 63, 367-386.
- Glenberg, A., Meyer, K. & Lindem, K. (1987). Mental models contribute to foregrounding in text comprehension. *Journal of Memory and Language*, 26, 69-83.
- Gotzner, N., Spalek, K. & Wartenburger, I. (in preparation). The impact of focus particles on the rejection of contrastive alternatives.
- Husband, E.M. and Ferreira, F. (2012). Generating contrastive alternatives: activation and suppression mechanisms. Talk given at the 25th CUNY Conference on Human Sentence Processing, New York, NY.
- König, E. (1991). *The Meaning of Focus Particles: A Comparative Perspective*. London: Routledge.
- Krifka, M. (2007). Basic notions of Information Structure. In Féry, C., Fanselow, G., & Krifka, M. The notions of information structure. *Interdisciplinary Studies on Information Structure. (ISIS)*, 6. Potsdam: Universitätsverlag Potsdam.
- Onea, E. & Beaver, D. (2011). Hungarian focus is not exhausted. In Ed Cormany, Satoshi Ito & David Lutz (eds.), *Proceedings of semantics and linguistic theory (SALT) 19*, 342-359.
- Pierrehumbert, J., & Hirschberg, J. (1990). The meaning of intonational contours in the interpretation of discourse. In P. Coehn et al. (Eds.), *Intentions in communication*. Cambridge: MIT Press.
- Rooth, M. (1992). A theory of focus interpretation. *Natural Language Semantics*, 1, 75-116.
- Spalek, K., Gotzner, N. & Wartenburger, I. (in revision). Not only the apples: focus particles influence memory for information-structural alternatives.
- Watson, D., Gunlogson, C., & Tanenhaus, M. (2008). Interpreting pitch accents in on-line comprehension: H* vs. L+H*. *Cognitive Science*, 32, 1232-1244.