

What's the alternative? Experimental research on the extent of focus alternative sets

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Introduction. The correct use and interpretation of information structure (IS) are key for successful communication. IS reflects the way the conveyed information is organised within an utterance with respect to the current communicative needs of the interlocutors (Chafe, 1976; Krifka, 2007). One notion of IS is focus. According to Alternative Semantics, the primary function of focus is to introduce alternatives for the focused element into the computation of the meaning of the sentence (Rooth, 1985, 1992). Previous experimental research has provided evidence in support of Alternative Semantics, showing that alternatives are cognitively real entities which are being activated in listeners' minds when processing a focused element (c.f. Braun & Tagliapietra, 2010; Gotzner, 2015; Gotzner, Wartenburger & Spalek, 2016; Husband & Ferreira, 2016). However, only little is known about which specific elements are considered as alternatives and are thus members of the alternative set that is part of the utterance's meaning.

There are two theories that make opposing claims about the extent of alternative sets, a permissive theory by Rooth (1985, 1992) and a more restrictive theory by Wagner (2006, 2012). According to Rooth, alternative sets are relatively broad, containing alternatives that match the focused element in their semantic type and that are contextually relevant. A listener encountering the sentence *Ben bought [pink]_F trousers* might thus generate an alternative set like *[black, blue, expensive, cheap, new, ripped]*, including all possible replacements for the focused adjective. Wagner, however, claims that alternative sets are more restricted. While he agrees with Rooth on the necessity for alternatives to be of the same semantic type and contextually relevant, he postulates that in addition alternatives and the focused element need to be contrastive and mutually exclusive. In the mentioned example, Wagner would predict an alternative set like *[blue, black, white, grey, beige]*. As only other colour adjectives are contrastive to the focused element and satisfy the requirement of mutual exclusion, only they are considered as true alternatives.

Present study. The aim of the current study was to investigate which specific elements are considered as alternatives for a focused constituent by gaining empirical evidence that either supports or contradicts the permissive or the restrictive theory on focus alternative sets. While previous studies investigating the availability of focus alternatives during language processing had used contrastive focus, we used new information focus.

We conducted a cross-modal priming experiment, where participants ($n = 29$) first listened to auditory discourses ($n = 45$) containing focused adjectives (1A, B), before completing a lexical decision task on a visually presented target word (1C). The target word was either an alternative for the focused prime word according to the permissive theory (Rooth alternative), an alternative according to the restrictive theory (Wagner alternative) or an unrelated target word that was no alternative according to either of the two theories, as they were no suitable substitutes for the focused adjectives in the given context. The targets of each group were matched in length, number of syllables and frequency.

- (1) A: Question (context sentence): *Was für ein Buch hat Georg in der Schule gelesen?*
(What kind of book did Georg read at school?)
B: Answer (critical sentence): *Er hat ein [spannendes]_F Buch gelesen.*
(He read an [exciting]_F book.)
C: Target words (3 conditions): *historisch* (historical - Rooth alternative)
langweilig (boring - Wagner alternative)
zufrieden (satisfied - unrelated target)

Furthermore, a pre-study was conducted to ensure that each target was a suitable candidate for its designated condition, namely that all Rooth and Wagner alternatives were equally good substitutes for the prime words in the given contexts, while the unrelated targets were not. In an online survey with 25 German native speakers, we investigated as how meaningful the critical sentences were perceived, when the prime word was replaced by either the Rooth alternative, the Wagner alternative or the unrelated target. The results confirm that both alternatives were equally meaningful replacements and therefore relevant adjectives in the given context, while the unrelated targets were not.

Based on previous psycholinguistic research, we expected that alternatives for the focused elements in our cross-modal priming experiment would be activated when processing the auditory stimuli including the focused adjective. This activation would then allow participants to recognise these alternatives faster in the subsequent lexical decision task than words that were not previously activated. Thus, the restrictive theory would predict only the contrastive Wagner alternatives to be facilitated, that is being recognised faster than the unrelated target baseline, whereas the non-contrastive Rooth alternatives should be recognised equally slow as the unrelated targets, as neither of these two target groups contain alternatives. The permissive account, however, would predict Wagner alternatives and Rooth alternatives to be facilitated, as both are considered alternatives for the focused elements.

Results. The statistical analysis was performed using a Linear mixed effect (LME) model that included the reciprocal transformation of reaction times, second order polynomial of the trial number and the target type as fixed effects, and the second order polynomial of the trial number for each participant and item as random effects. The mean reaction time for Rooth alternatives was 616.56 ms (sd = 152.72) and 618.55 ms (sd = 163.48) for Wagner alternatives, while the mean reaction time for the unrelated targets was longer, namely 646.14 ms (sd = 157.50). The results of the LME model show that the reaction time difference between the two alternative conditions and the unrelated target condition was significant ($t = - 4.62$, $p < 0.0001$), meaning that reaction times for both alternative types (Rooth and Wagner alternatives) together were significantly faster than the reaction time for the unrelated targets. More importantly, the reaction time for Rooth alternatives was significantly faster than the reaction time for the unrelated targets ($t = - 3.80$, $p < 0.0002$), and the reaction time for Wagner alternatives was also significantly faster than for unrelated targets ($t = - 4.19$, $p = 0.0001$). However, the reaction time difference between the two alternative conditions (Wagner alternatives vs. Rooth alternatives) was not significant ($t = 0.42$, $p = 0.675$).

Discussion and Conclusion. The data presented above show that there was a significant difference between the two alternative conditions and the unrelated target condition. Participants recognised words that could substitute the focused prime word significantly faster than words that were no possible substitutes. More importantly, there was a significant difference in reaction time between each of the alternative conditions, Rooth alternatives and Wagner alternatives, compared to the unrelated targets, thus suggesting that both types of alternatives were activated upon hearing the focused adjectives. Therefore, the results of this study support Rooth's permissive theory (1985, 1992), namely that alternative sets contain a broad set of grammatically and contextually appropriate replacements for the focused element, and not just contrastive and mutually exclusive ones, as postulated by the restrictive theory by Wagner (2006, 2012). These findings are in line with Gotzner (2015), who also argues in favour of the permissive theory by Rooth based on the results of a post-hoc analysis she conducted on existing data. Furthermore, our study contributes evidence that alternatives are not necessarily of the same semantic network as the focused element (see also Gotzner, 2015; Kim et al., 2015). While Wagner alternatives were semantically closely related with the focused adjectives (*exciting – boring*), Rooth alternatives were not (*exciting – historical*). The relationship between Rooth alternatives and the focused element in our experiment was only established through context, showing that the restriction of alternative sets is greatly influenced by context.

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