

## **Contextual effects on the processing of adjective order**

Hanna Weiland-Breckle, University of Cologne

The order of adjectives in prenominal position is not unconstrained. Different syntactic (e.g., Kemmerer et al., 2007), semantic (e.g., Ziff, 1960, Hetzron, 1978) and pragmatic (e.g., Danks & Glucksberg, 1971) mechanisms have been proposed to guide adjective linearization. The latter suggested pragmatic communication constraints instead of grammatical rules and argued that the speaker's goal is to enable the listener to distinguish between a set of alternatives as quickly as possible which may result in the use of the non-canonical adjective order. We investigate the addressee's side and the question whether the processing of the non-canonical order is licensed by communicative needs.

We conducted an ERP experiment in German consisting of two studies using different contexts to investigate the influence of speaker's meaning on the processing of adjective order. To establish pragmatic communication constraints we used context sentences. In Study 1 the context sentences were always neutral (1), in Study 2 the context sentences were biased either towards size (2) or color (3). They were followed by a target sentence with either canonical size-before-color (A) or non-canonical color-before-size (B) order. To counter high expectations for two adjectives in the target sentences, we included filler items with only one adjective. The materials were presented visually word by word and the ERPs were time-locked to the first and second adjective and the head noun.

### **Context sentences**

- (1) Susanne walks across a parking area.
- (2) On a parking area, Marina does research on car sizes.
- (3) On a parking area, Simone compares different car colors.

### **Target sentences**

- (A) She counts many small red cars.
- (B) She counts many red small cars.

We predicted to find context effects at the first adjective and order effects as early as at the second adjective. Surprisingly, the ERPs showed effects of adjective at the first and second adjective – suggesting that the *type* of adjective (size vs. color) had an impact above and beyond order and context. In addition, we observed an interaction of context and adjective order at the position of the noun for the biased contexts. We elaborate on these findings below.

In both studies, we found a more pronounced N400 for color than size adjectives independent of context and order on both adjective positions. This finding may be best explained by properties of the two tested adjective classes. First, the size adjectives tested here are significantly more frequent (based on *Wortschatz Leipzig*) than the used color adjectives. Frequency has been shown to correlate with the N400 amplitude, which is

reflected in a more pronounced N400 for color adjectives (surfacing at 1<sup>st</sup> adjective in non-canonical condition (B) and at 2<sup>nd</sup> adjective in canonical position (A)) over size adjectives. Second, while color adjectives can be interpreted independent of the head noun, size adjectives are relative adjectives and require the head noun, at least in prenominal position, for interpretation (e.g., McKinney-Bock, 2010). The latter, lexically not yet fully specified class could therefore elicit a reduced negativity. From an incremental processing perspective it is really surprising that we did not find any context effects on the adjectives. This clearly needs further investigation.

The interaction of context and order found in Study 2 resulted from a more pronounced N400 for the non-canonical order after the size context (2B). In contrast, after the color context (Study 2), as well as after the neutral context (Study 1), the adjective order has no influence on the processing of the noun. These findings can be best explained by the interplay of expectations triggered by the context sentence and the adjective order. In line with Kemmerer et al (2007) we argue that independent of context the parser prefers an interpretation like [adjective + [adjective + noun]]<sub>NP</sub> after encountering the unexpected second adjective in the non-canonical order to make sense of the wrong adjective ordering. Hence the speaker now talks about a set of small cars ([red + [small + car]]) with *red* as the relevant property to pick the correct alternatives of the set of small cars. This has neither an influence on the neutral context, where no expectancies are created, nor on the color context. In the latter the speaker still talks about the color of a set as the distinguishing property and this matches the relevant property triggered by the color context. This is not the case for the non-canonical order in the size context: After encountering the second adjective ([red + [small + X]]) the parser does not expect *car* since it expected the speaker to talk about cars in the context of size. Therefore it expects the speaker to talk about something else now and the unexpected word *car* elicited a more pronounced N400.

In sum, our results show that pragmatic communication constraints do not per se override the canonical order of prenominal adjectives since contextual information have no influence on the processing of prenominal adjectives. The processing of the respective head noun, however, is influenced by a combination of syntactically and pragmatically induced expectancies.

## References

- Danks, J. H., & Glucksberg, S. (1971). Psychological scaling of adjective orders. *Journal of Verbal Learning and Verbal Behavior*, 10(1), 63-67.
- Hetzron, R. (1978). On the relative order of adjectives. In H. J. Seiler (Ed.), *Language universals* (pp. 165-184). Tübingen: Gunter Narr Verlag.
- Kemmerer, D., Weber-Fox, C., Price, K., Zdanczyk, C., & Way, H. (2007). Big brown dog or brown big dog? An electrophysiological study of semantic constraints on prenominal adjective order. *Brain and Language*, 100(3), 238-256.
- McKinney-Bock, K. (2010). Adjective ordering restrictions: exploring relevant semantic notions for syntactic ordering. *Coyote Papers*, 3, 1-16.
- Ziff, P. (1960). *Semantic analysis*. Ithaca, N.Y.: Cornell University Press.