

EXPECTATION-BASED SENTENCE PROCESSING IN PROSPECTIVE NPI LICENSING

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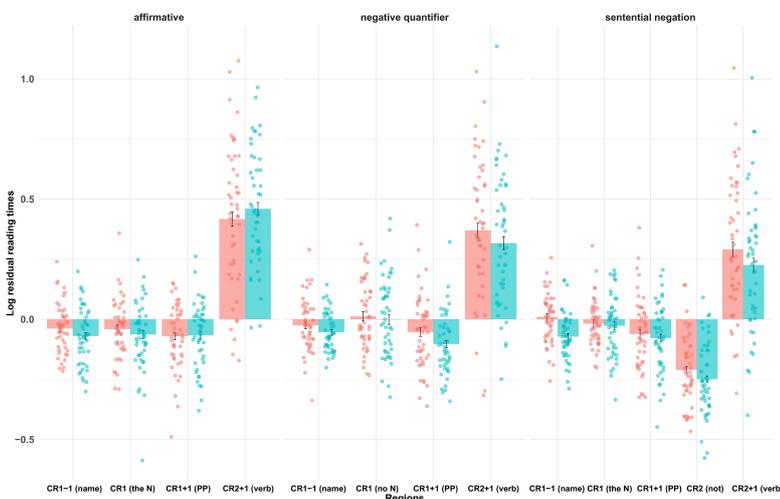
Introduction

Negative polarity items (NPIs) such as *any* or *ever* are lexical items that need to be licensed by appropriate contexts [1;2;3]. To shed more light on the nature of this licensing mechanism, the on-line processes via which NPIs are integrated during sentence processing have been investigated in psycho- and neurolinguistic studies by measuring the reading times [9;12], or ERP-components [6;8;10;13] at the occurrence of an NPI that is either licensed or unlicensed in a given context (e.g. ‘Anna has *(not) read **any**_{NPI} books this year.’). However, some NPIs in German can also appear *ahead* of their licenser (see (1)). Critically, with the considerable evidence that humans form expectations about upcoming material while processing incomplete dependencies [4;5], we predicted that in such cases reading an NPI would give rise to licenser expectations. Investigating the on-line processing of NPIs and their licensing contexts from this perspective may provide new insight into the licensing mechanism.

Methods: To test whether NPIs give rise to licenser expectations, we used a self-paced reading task with subsequent naturalness ratings. Our experiment used a 2x3 design (1) with the factors polarity (NPI vs. polarity-insensitive phrase) and context (affirmative vs. early negation vs. late negation). The items either used an NPI ‘*so recht*’ (≈ ‘really’) or a polarity-insensitive (nonPI) adverbial phrase ‘*sehr gut*’ (‘very good’) in the sentence-initial position. Since the nonPI does not require a licenser, the reading times (RTs) in the nonPI conditions served as baseline against which to compare the RTs in NPI conditions. We manipulated the context factor by using either a fully affirmative context (which is ungrammatical with the NPI), or included an NPI licenser at either an early position (negative quantifier; e.g. ‘*kein Kuchen*’/‘no cake’), or a late position (sentential negation; *nicht*/not). The critical regions (CRs) for analysis were the two licenser positions.

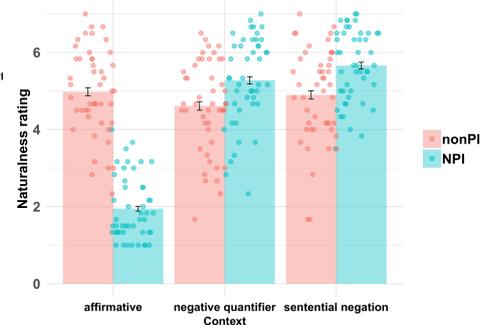
- (1) [(a) *So recht*_{NPI} / (d) *Sehr gut*_{nonPI}] hat Paul [*der Kuchen*]_{CR1} von der Bäckerei geschmeckt.
 [(a) *So really*_{NPI} / (d) *Very good*_{nonPI}] has Paul [*the cake*]_{CR1} of the bakery tasted.
 [(b) *So recht*_{NPI} / (e) *Sehr gut*_{nonPI}] hat Paul [*kein Kuchen*]_{CR1} von der Bäckerei geschmeckt.
 [(b) *So really*_{NPI} / (e) *Very good*_{nonPI}] has Paul [*no cake*]_{CR1} of the bakery tasted.
 [(c) *So recht*_{NPI} / (f) *Sehr gut*_{nonPI}] hat Paul [*der Kuchen*]_{CR1} von der Bäckerei [*nicht*]_{CR2} geschmeckt.
 [(c) *So really*_{NPI} / (f) *Very good*_{nonPI}] has Paul [*the cake*]_{CR1} of the bakery [*not*]_{CR2} tasted.
 ‘Paul (did not like/liked) (the/no) cake from the bakery very much.’

Results: Log-transformed residual reading times (Fig.1) revealed two main findings: for both licensers we find evidence that the NPI generated expectations that facilitated processing the licenser. For the negative quantifier this effect surfaced only at the spillover region (CR1+1) ($p < .05$), for sentential negation it showed at the CR2 ($p < .05$) and remained marginally significant ($p = .066$) throughout the spillover region (CR2+1). In the affirmative contexts (1a. vs. 1d.), we find no significant effects. Naturalness ratings confirmed that subjects perceived affirmative contexts as ungrammatical with the NPI ($p < .0001$) (Fig.2).



◀ Figure 1

Figure 2 ▼



Discussion: Despite being closer to the NPI, the effect at the negative quantifier was numerically weaker and delayed. One possible cause is that readers have generated an expectation for the lexical identity of the licenser;

the statistical frequency of specific NPI-licenser pairings may thus act as causal bottleneck for the licenser expectations [11]. Alternatively, the expectation may simply have increased with distance, i.e. there is an anti-locality effect [4;5] for NPI licensing in German. We will address these questions in future studies. As our next step, we will adapt the material from (1) for EEG, where we plan to analyse both the ERP components at the licenser positions [8], and the neural oscillations in the material preceding the licenser positions, as oscillatory activity can serve as direct empirical evidence for predictive processing during sentence comprehension [7].

References

- [1] Chierchia, C. (2006). Broaden your views. Implicatures of domain widening and the ‘logicality’ of language. *Linguistic Inquiry*, 37, 535-590.
- [2] Giannakidou, A. (2011). Negative and positive polarity items. In von H. Klaus, C. Maienborn, & P. Portner (Eds.), *Semantics: An International Handbook of Natural Language Meaning*, de Gruyter (pp. 1660-1712).
- [3] Krifka, M. (1995). The semantics and pragmatics of polarity items in assertion. *Linguistic Analysis*, 15, 209-257.
- [4] Levy, R. (2008). Expectation-based syntactic comprehension. *Cognition*, 106(3), 1126–1177.
- [5] Levy, R., & Keller, F. (2013). Expectation and locality effects in German verb-final structures. *Journal of Memory and Language*, 68(2), 199–222.
- [6] Liu, M., König, P., and Mueller, J. L. (2019). Novel ERP Evidence for Processing Differences between Negative and Positive Polarity Items in German. *Frontiers in Psychology*, 10, 376.
- [7] Meyer, L. (2018). The neural oscillations of speech processing and language comprehension: state of the art and emerging mechanisms. *European Journal of Neuroscience*, 48, 2609–2621.
- [8] Pablos, L., Doetjes, J., Ruijgrok, B. J., & Cheng, L. L. S. (2019). Backward licensing of Negative Polarity Items in Dutch: An ERP investigation. *Journal of Neurolinguistics*, 51, 96–110.
- [9] Parker, D., & Phillips, C. (2016). Negative polarity illusions and the format of hierarchical encodings in memory. *Cognition*, 157, 321-339.
- [10] Saddy, D., Drenhaus, H., & Frisch, S. (2004). Processing polarity items: Contrastive licensing costs. *Brain and Language*, 90(1), 495-502.
- [11] Smith, N. J., & Levy, R. (2013). The effect of word predictability on reading time is logarithmic. *Cognition*, 128(3), 302–319.
- [12] Xiang, M., Grove, J., & Giannakidou, A. (2013). Dependency-dependent interference: NPI interference, agreement attraction, and global pragmatic inferences. *Frontiers in psychology*, 4, 708.
- [13] Yurchenko, A., den Ouden, D. B., Hoeksema, J., Dragoy, O., Hoeks, J. C., & Stowe, L. A. (2013). Processing polarity: ERP evidence for differences between positive and negative polarity. *Neuropsychologia*, 51(1), 132-141.