Comparing licensing processes at the interfaces of syntax, semantics and pragmatics

Anna Czypionka, Mariya Kharaman, Josef Bayer, Maribel Romero & Carsten Eulitz (University of Constance)

anna.czypionka@uni-konstanz.de

Linguistic licensing, local as well as seemingly non-local, is syntax-controlled (e.g., number agreement, reflexive binding, trace-binding in cyclic movement etc.), but may also take place at the interfaces of syntax, semantics and pragmatics. The latter type of licensing raises questions about the interplay between different components of grammar during sentence comprehension, and about their interaction with other cognitive systems like working memory. We use a range of offline and online methods to compare different licensing phenomena at these interfaces in German sentence comprehension. We address both established and new interface licensing phenomena to move toward a more general account of linguistic dependencies.

The first phenomenon is the licensing of negative and positive polarity items (**NPIs** and **PPIs**) like *jemals* ('ever') and *durchaus* ('certainly'). These must be licensed by a downward-entailing operator, e.g. negation, or by the absence of negation, (1a) and (1c) [4]. Normally, the operator must locally c-command the NPI. However, a number of language processing studies on English and German have found evidence for *intrusive licensing* by a non-c-commanding licenser (1b) [3, 6, 7, 8, 9], or pragmatic licensing by implicit negation [10]. These findings have sparked discussions about the nature of the underlying linguistic illusions, their relation to working memory, and the division of labor between semantic and pragmatic licensing (see [5] for an overview).

The second phenomenon is the licensing of question-sensitive discourse particles (**QDiPs**) like German *denn* (lit. 'then'). These must be licensed by a c-commanding Q(uestion)-operator or *wh*-trace [1]. Unlike NPI licensing, QDiP licensing has only recently been described in the sentence comprehension literature [2], and it remains unclear to which extent this phenomenon is subject to intrusive licensing.

Both NPI/PPIs and QDiPS enrich the pragmatic impact of their surrounding clause type (negation, assertion or question), while being constrained by syntax and semantics in systematic ways. In combination, they allow us to proceed from the investigation of isolated licensing phenomena to a more general understanding of licensing processes at the interfaces of syntax, semantics and pragmatics.

We show data from rating studies, self-paced reading and ERP measurements of these different licensing phenomena. For QDiPs, rating studies show graded reductions in acceptability for absent (2b,d) and inaccessible (2c) relative to accessible (2a) Q-licensers. Self-paced reading studies show enhanced processing costs for absent (2b,d), but not for inaccessible (2c) Q-licensers, suggesting that the violation of some licensing constraints is not robust under time pressure. This in turn suggests either a graded increase in processing costs for graded violations, or illusory licensing by inaccessible licensers, similar to what has been described for NPI licensing. ERP measurements for QDiPs show increased P600 amplitudes for absent licensers (2b,d), and mildly increased P600 amplitudes for inaccessible licensers (2c), but no differences in the N400 time window. In contrast, the same datasets reveal that unlicensed NPIs (1b,c) elicit enhanced N400 amplitudes but no visible difference in the P600 time window (in parallel to some of the literature on German NPIs, but in contrast to English NPIs, for which licensing violations tend to elicit P600s). This suggests that differences between findings for English and German NPIs in the literature cannot be reduced to different strategies in both languages, but rather suggest that the respective experiments tap into different subprocesses

during licensing at the interfaces.
We discuss (i) parallels and differences between QDiP and NPI licensing behavior (ii) possible underlying reasons for both licensing violations (illusions or graded reductions in acceptability), and (iii) different possible subprocesses in licensing at the interfaces.

Additional Material: Examples of language materials for experimental conditions

NPIs and PPIs: (a) accessible NEG-licenser, (b) inaccessible NEG-licensers, (c) no NEG-licenser (stimuli based on Vasishth et al. 2008)

(1a)   <u>Kein</u> Biologe, der eine Brille aufgesetzt hatte, war **jemals/*durchaus** gesprächig.
   *No biologist who det glasses put.on.part. aux was **NPI/PPI** talkative.*
   '<u>No</u> biologist who wore glasses was **ever/*certainly** talkative.'

(1b)   <u>Ein</u> Biologe, der <u>keine</u> Brille aufgesetzt hatte, war ***jemals/durchaus** gesprächig.
   *A biologist who no glasses put.on.part. aux was **NPI/PPI** talkative.*
   '<u>A</u> biologist who wore <u>no</u> glasses was ***ever/certainly** talkative.'

(1c)   <u>Ein</u> Biologe, der eine Brille aufgesetzt hatte, war ***jemals/durchaus** gesprächig.
   *A biologist who no glasses put.on.part. aux was **NPI/PPI** talkative.*
   '<u>A</u> biologist who wore no glasses was ***ever/certainly** talkative.'

QDiPs: in root clause with (a) accessible Q-licenser, (b) no Q-licenser;
   in embedded clause with (c) inaccessible Q-licenser, (d) no Q-licenser

(2a)   <u>Wer</u> hat den Kuchen aus der Bäckerei **denn** aufgegessen?
   *who has the cake from the bakery **QDiP** up.eat.part*
   '<u>Who</u> **then** ate the cake from the bakery?' [Please note that the exact flavor of *denn* cannot be translated.]

(2b)   * Robert hat den Kuchen aus der Bäckerei **denn** aufgegessen.
   *Robert has the cake from the bakery **QDiP** up.eat.part*
   '<u>Robert</u> **then** ate the cake from the bakery.'

(2c)   * <u>Wer</u> hat gesagt, dass die Oma den Kuchen **denn** aufessen muss?
   *who has said that the granny the cake **QDiP** up.eat.part must*
   '<u>Who</u> said that the granny should eat the cake **then**?'

(2d)   * <u>Robert</u> hat gesagt, dass die Oma den Kuchen **denn** aufessen muss.
   *Robert has said that the granny the cake **QDiP** up.eat.part must*
   '<u>Robert</u> said that the granny should eat the cake **then.**'

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