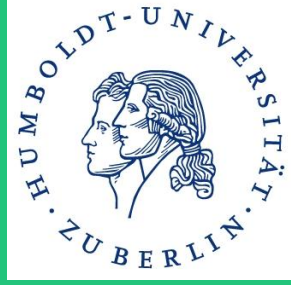


# ERP-study: Gender interference effects of German (L1) in English (L2)sentence processing

Anna Renner, Katharina Spalek  
Humboldt-Universität zu Berlin, Germany



**Introduction:** A long-standing question in bilingualism research is to what extent the L1 remains active during L2 processing (MacWhinney, 2005) and under which circumstances the two language systems of a bilingual are able to operate more or less independently. L1 transfer has been demonstrated in a variety of domains such as e.g., semantics (Dijkstra, 2005 ) and syntax (Frenck-Mestre, 2005). Also in research on grammatical gender there is an on-going discussion whether the two gender systems of a bilingual are shared or not and in what ways and under which circumstances L1 grammatical gender can influence L2 processing. L1 gender interference so far has been demonstrated in various experiments: e.g., in a translation task from Greek (L1) to German (L2) (Salamoura & Williams, 2007), in an eye-tracking experiment with Dutch (L1) and English (L2) (Conklin, Dijkstra & van Heuven, 2008) and in a lexical decision task with German (L1) and Dutch (L2) (Lemhöfer, Spalek & Schriefers, 2008). In contrast, Costa, Kovacic, Franck and Caramazza (2003) didn't find a gender interference effect for Croatian and Italian, Spanish and Catalan, French and Italian. These studies differ with regard to subjects' proficiency levels and the languages used. In the present experiment we investigated the following questions: Can gender information specific to German interfere with pronoun resolution in English sentences? How is this gender transfer mediated by L2 proficiency?

## Method:

**28 Subjects:** L1 German, L2 English (low-proficient; A1-B1 according to C-test)

**Task:** Reading simple sentences followed by a Grammatical Judgment Task (GJT)

**Dependent measures:** Behavioral: error rates in GJT

Online: ERP components (P600) on pronouns reflecting syntactic violations

**Stimuli:** A short introductory sentence followed by a sentence with a correct or incorrect pronoun. Pronouns refer to inanimate nouns, e.g. „bus“. Contrary to English, the German translation of „bus“ has masculine grammatical gender.

Pronouns are either

- correct in English but not German (“bus” and “it”; correct condition),
- correct in German but not in English (“bus” and “he”; pseudocongruent condition) or
- incorrect in both languages (“bus” and “she”; incongruent condition):

„This is a **bus**.  
\***He**/\***she**/**it** is big and crowded.“

48 sentence pairs x 3 pronouns = 144 sentences.

24 of the sentences pairs contained a noun whose translation equivalent in German would be masculine, 24 feminine. ERPs were measured time-locked to the pronouns.

- Can L2 pronoun resolution be influenced by L1 gender information?
- How is L1 gender transfer mediated by L2 proficiency?

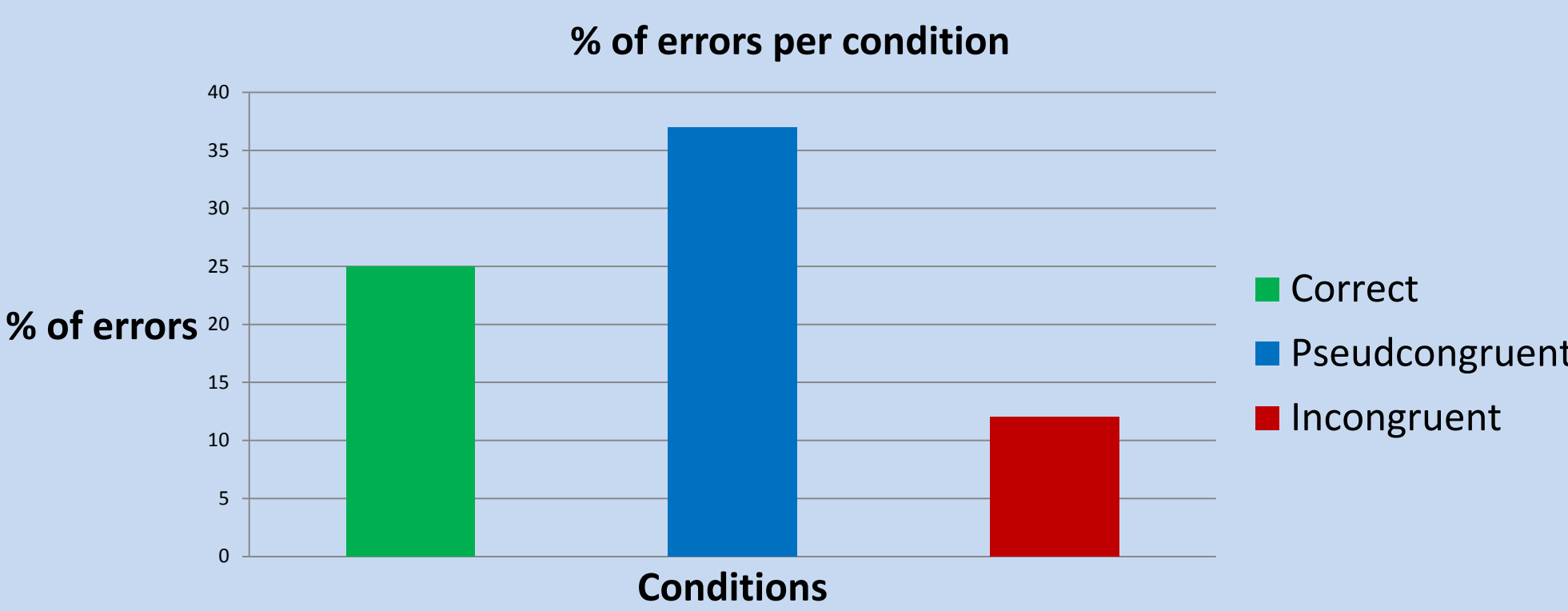
**Predictions:** If subjects are influenced by German gender information, they should

1. make more errors in the pseudocongruent condition.
2. perceive the pronoun “she” referring to “bus” as a greater syntactic violation than the pronoun “he”. This should be reflected by a greater P600 effect for the incongruent than the pseudocongruent condition..
3. L1 gender interference should be weaker for the higher proficient speakers.

## Results and Discussion:

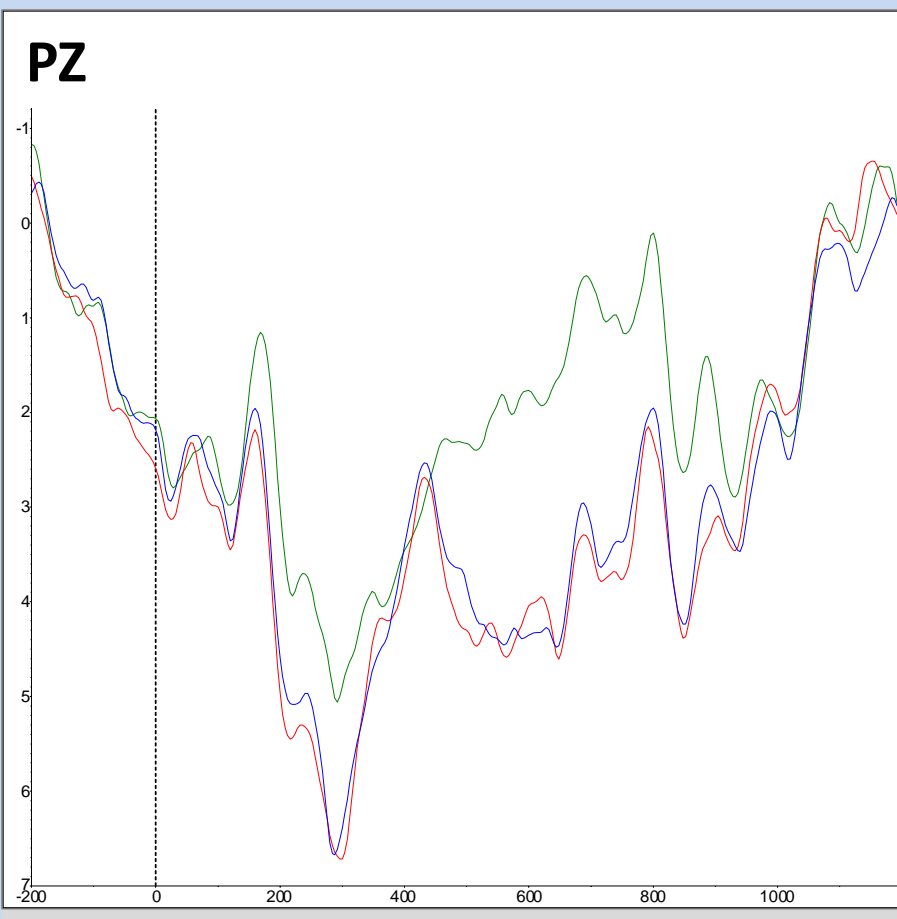
### 1. Behavioral results (error rates):

Consistent with our expectations, subjects made a lot more errors in the pseudocongruent condition than in the incongruent condition. Error rates show a significant influence of German gender . The correct condition also proved to be significantly more difficult than the incongruent condition. (All  $p = 0,000$ ).



## Results and Discussion:

### 2. ERPs: Overall Analysis



Green = correct condition,  
blue = pseudocongruent condition,  
red = incongruent condition.

Negative is plotted upward.

Compared to the correct condition, a significant P600 effect can be observed for the incongruent condition ( $p = 0,025$ ). Contrary to our expectations, also the pseudocongruent condition elicited a significant P600 ( $p = 0,051$ ). The P600 showed a posterior distrubution.

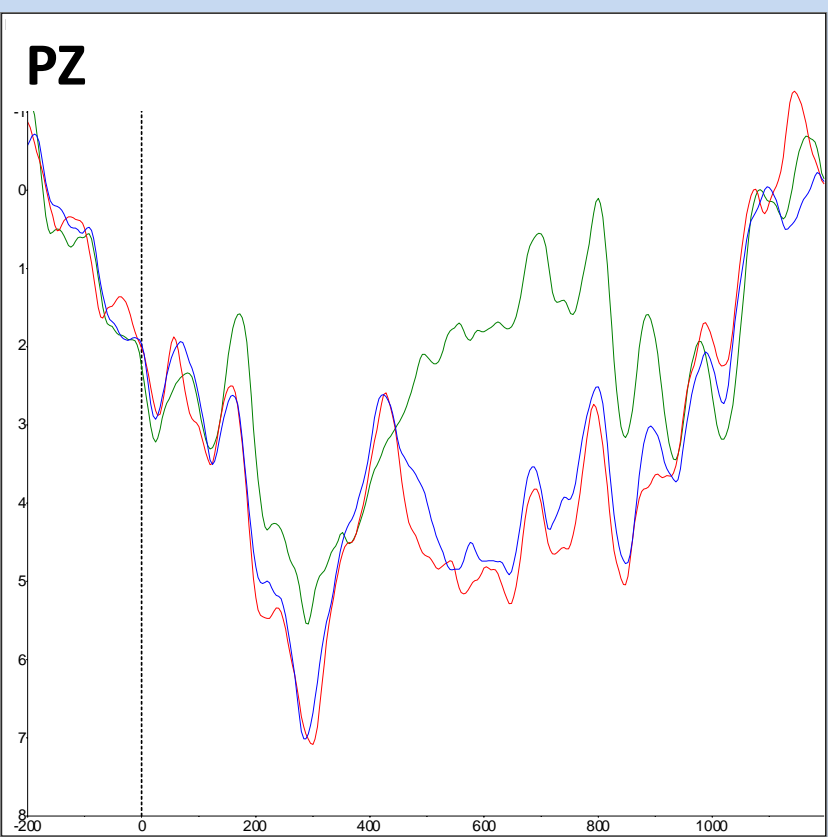
According to the ERP result, subjects seem to perceive „he“ referring to „bus“ as equally incorrect as „she“, contrary to the pattern of error rates. There is no difference in the P600 amplitudes between the pseudocongruent and incongruent condition. The difference with the baseline conditon „it“ is significant.

### 4. Language proficiency according to C-test

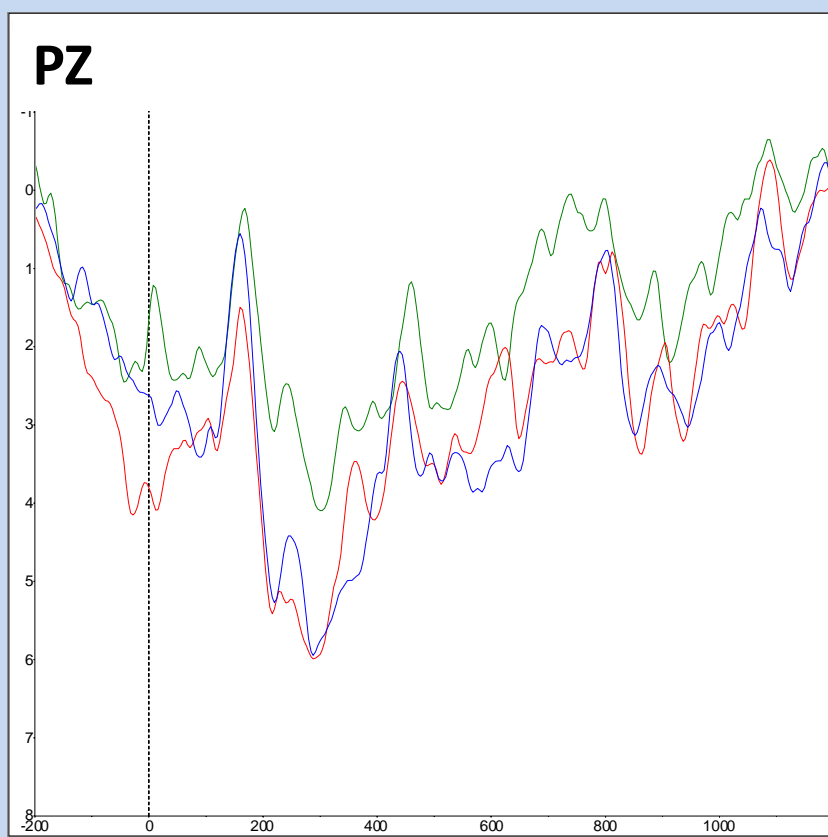
Since even our quite low-proficient group didn't show evidence of L1 gender transfer in their ERP results, we refrained from testing a higher proficient group and investigated possible differences inside our low-proficient group instead. However, when splitting our low-proficient group into a lower and higher proficient group according to C-test scores, no significant differences in the ERP results were obtained. Possibly the C-test is not a fine-grained enough measure or there were too few very low-proficient subjects (A1-A2) in order for any effects to become significant.

### 3. ERPs of groups divided by error pattern

Subjects were divided into two groups, according to whether they showed the expected error pattern in the behavioral analysis, i.e. at least 10% more errors in the pseudocongruent than in the incongruent condition (group 2), or not (group 1).



Group 1 (15 subjects) showing no German gender interference in error rates show an equally strong P600 effect for the incongruent as for the pseudocongruent condition.



Group 2 (13 subjects) shows German gender interference in their error rates. This is effect is not reflected in the ERP data. There is no difference between the three conditions.

## Conclusion:

An effect of L1 gender transfer was observed as predicted in the error rates, but this effect was not reflected in the ERP measures. The P600 effect was as big for the pseudocongruent condition as for the incongruent condition. So even our very low-proficient subjects already showed a pattern in the online measures that could be expected for high-proficient L2 and native speakers.

When subjects were divided into two groups according to error patterns, the group without L1 transfer showed the same result that was obtained in the overall analysis., thus displaying sensitivity to L2 gender violations at what can probably be considered a native speaker's level. The group that had shown L1 gender transfer however, showed no sensitivity to L2 gender violations at all.

Since usually online measure are thought to be more sensitive to processing difficulties, it is surprising that our ERP results differ from our behavioral results. Possibly, the latter group showed no sensitivity to gender violations yet in the epoch that ERPs were measured, but were later influenced by their L1 in their behavioral response.

## References

- Conklin, K., Dijkstra, T. & van Heuven, W., Influence of Dutch grammatical gender on the processing of English pronouns: Evidence from eyetracking: (in preparation).
- Costa, A., Kovacic, D., Franck, J., & Caramazza, A. (2003). On the autonomy of the grammatical gender systems of the two languages of a bilingual. *Bilingualism: Language and Cognition*, 6(3), 181-200.
- Dijkstra, T. (2005). Bilingual Visual Word Recognition and Lexical Access. In: J.F. Kroll & A.M. B. De Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches*. Oxford: Oxford University Press.
- Frenck-Mestre, C. (2005). Ambiguities and Anomalies: What Can Eye Movements and Event-Related Potentials Reveal About Second Language Sentence Processing? In: J.F. Kroll & A.M. B. De Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches*. Oxford: Oxford University Press.
- Lemhöfer, K., Spalek, K., & Schriefers, H. (2008). Cross-language effects of grammatical gender in bilingual word recognition and production. *Journal of Memory and Language*, 59, 312-330.
- MacWhinney, B. (2005). A Unified Model of Language Acquisition. In: J.F. Kroll & A.M. B. De Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches*. Oxford: Oxford University Press.
- Salamoura, A., & Williams, J. N. (2007). The representation of grammatical gender in the bilingual lexicon: Evidence from Greek and German. *Bilingualism: Language and Cognition*, 10(3), 257-275.