

## Natural Gender Processing in L2 German by Chinese Speakers: Evidence from Self-Paced Reading and Grammaticality Judgments

Ruofan Zhang (ruofan.zhang@stud.uni-heidelberg.de), Johannes Gerwien, Sandra Pappert  
Institute of German as a Foreign Language, Heidelberg University

Chinese marks gender distinctions in third-person singular pronouns orthographically but not phonologically, as 他 (3SG.M), 她 (3SG.F), and 它 (3SG.N) are all pronounced /tā/. This property has been linked to difficulties among Chinese learners of languages in which gender distinctions are overt in both speech and writing. Studies on Chinese learners of English have reported gender-marking errors in pronoun production <sup>[1][2]</sup> and reduced sensitivity to gender violations in online comprehension tasks <sup>[3]</sup>. Whether similar patterns extend to German remains largely unknown. Therefore, we ask whether Chinese learners detect natural gender agreement violations during online sentence processing, whether they possess explicit knowledge of natural gender agreement, and whether these abilities are modulated by L2 proficiency. This question speaks to a central debate in second language acquisition: whether persistent difficulties with gender agreement reflect representational deficits or limitations in real-time processing <sup>[4][5]</sup>.

Based on a separate norming study conducted with a different group of Chinese learners, 32 German proper names familiar to the target population were selected. Forty Chinese learners of German then completed a self-paced reading task, a grammaticality judgment task, and a German C-test. The critical stimuli followed a 2 × 2 factorial design, manipulating Antecedent Gender (feminine vs. masculine) and Agreement (match vs. mismatch) (see Stimuli). Reading times were analyzed at the pronoun region and two spill-over regions.

At the pronoun region, a significant gender × match interaction was observed ( $\beta = -0.079$ ,  $p = .027$ ). However, this interaction was not replicated when analyses were conducted using pronoun form rather than antecedent gender as the coding factor, providing no robust evidence for gender-specific mismatch sensitivity. The online mismatch effect emerged at the first spill-over region, where participants showed significantly longer reading times in mismatch than match conditions ( $\beta = 0.052$ ,  $p = .031$ ). No reliable effects were observed in the second spill-over region. Furthermore, the mismatch effect at the first spill-over region was not correlated with C-test scores ( $r = -.093$ ,  $p = .586$ ). In the grammaticality judgement task, participants achieved high accuracy ( $M = .918$ ,  $SD = .110$ ), and the correlation between C-test scores and judgement accuracy was positive but marginal ( $r = .30$ ,  $p = .059$ ).

These findings suggest that Chinese learners of German are sensitive to natural gender agreement violations during online processing and demonstrate explicit knowledge of German gender agreement in offline judgments. Furthermore, neither online sensitivity nor offline judgment accuracy was significantly associated with proficiency. Taken together, these findings are more compatible with processing-based accounts than with accounts attributing persistent difficulties primarily to deficient grammatical representations.

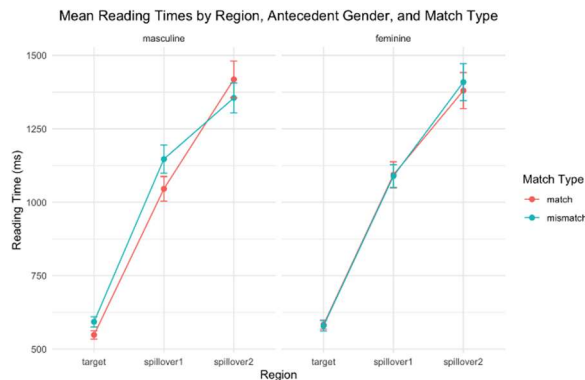
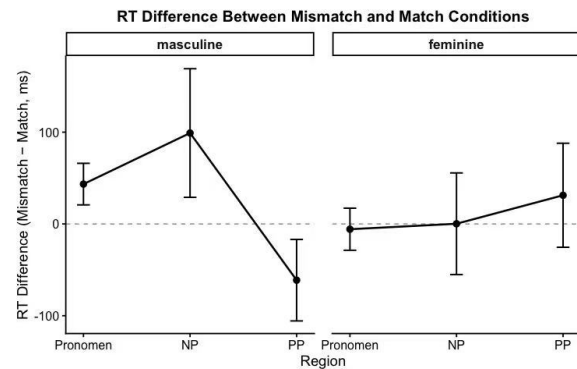
**Figure 1****Figure 2**

Figure 1. Mean reading times in the target, first spill-over, and second spill-over regions, separated by antecedent gender and match type. Error bars indicate standard errors.

Figure 2. Reading time differences between mismatch and match conditions across critical regions. The plot shows the mismatch effect (mismatch - match) in reading times for masculine and feminine antecedents. A positive difference reflects increased processing difficulty under mismatch conditions. Error bars indicate standard errors.

## References:

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- [3] Dong, Y., Wen, Y., Zeng, X., & Ji, Y. (2015). Exploring the cause of English pronoun gender errors by Chinese learners of English: Evidence from the self-paced reading paradigm. *Journal of Psycholinguistic Research*, 44(6), 733–747.
- [4] Grüter, T., Lew-Williams, C., & Fernald, A. (2012). Grammatical gender in L2: A production or a real-time processing problem? *Second Language Research*, 28(2), 191–215.
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## Stimuli:

### Examples:

| conjunction | proper name | adverbial  | verb 1     | verb 2  | pronoun | NP                 | PP               |
|-------------|-------------|------------|------------|---------|---------|--------------------|------------------|
| Wenn        | David       | regelmäßig | trainiert, | erzielt | er      | bessere Ergebnisse | in den Übungen.  |
| Da          | Phillip     | schlecht   | schläft,   | braucht | er      | viel Kaffee        | vor der Prüfung. |

| Condition                 | Antecedent<br>gender | Agreement<br>type | Example stimulus                                                                                                                                                                                        |
|---------------------------|----------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Masculine–Match</b>    | Masculine            | Match             | Wenn / <b>David</b> / regelmäßig / trainiert, / erzielt / <b>er</b> / bessere Ergebnisse / in den Übungen.<br>(If <b>David</b> trains regularly, <b>he</b> achieves better results in the exercises.)   |
| <b>Masculine–Mismatch</b> | Masculine            | Mismatch          | Wenn / <b>David</b> / regelmäßig / trainiert, / erzielt / <b>sie</b> / bessere Ergebnisse / in den Übungen.<br>(If <b>David</b> trains regularly, <b>she</b> achieves better results in the exercises.) |
| <b>Feminine–Match</b>     | Feminine             | Match             | Wenn / <b>Maria</b> / regelmäßig / trainiert, / erzielt / <b>sie</b> / bessere Ergebnisse / in den Übungen.<br>(If <b>Maria</b> trains regularly, <b>she</b> achieves better results in the exercises.) |
| <b>Feminine–Mismatch</b>  | Feminine             | Mismatch          | Wenn / <b>Maria</b> / regelmäßig / trainiert, / erzielt / <b>er</b> / bessere Ergebnisse / in den Übungen.<br>(If <b>Maria</b> trains regularly, <b>she</b> achieves better results in the exercises.)  |