

## Beta power reduction in response to subject-verb honorific agreement violations in Korean

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Oscillatory dynamics have been proposed to reflect the same neural changes as ERP components, albeit through different mechanisms (Hagoort et al., 2004). However, the lack of clear associations between the two suggests that oscillatory signatures involve more than mere time-frequency transformations of ERP components (cf. Prystauka & Lewis, 2018). This study aims to further our understanding of neural oscillations by examining the processing of subject-verb honorific agreement in Korean. By investigating the relationship between ERP components and oscillatory dynamics, it seeks to contribute to our knowledge of how morphosyntactic features based on social hierarchy are processed in the brain.

Subject honorification in Korean is encoded with the verbal suffix *-si-*. Its use conveys the speaker's respect or humility toward the sentential subject (1a) and is incompatible with a nonhonorific subject, such as *Mary* (1b), as personal names in Korean do not carry honorific features. A previous ERP study on subject-verb honorification has identified a P600 response to violations of honorific agreement (Kwon & Sturt, 2024), consistent with findings on gender, number, or person agreement violations, which also elicit a P600 (Coulson et al., 1998; Hagoort et al., 1993; Osterhout & Mobley, 1995). This suggests that social-hierarchical violations in Korean are perceived as structural anomalies. Thus, given the relevance of beta oscillations in structure building (Bastiaansen & Hagoort, 2015) and maintaining cognitive sets (Lewis & Bastiaansen, 2015), honorific agreement violations, such as (1b) and (1c), are hypothesized to be associated with reductions in beta power.

The experiment included three conditions ( $n = 34$ ; Neuroscan), as shown in (1), to examine the neural processing of subject-verb honorific agreement violations in Korean using EEG. For a time-frequency (TF) analysis, evoked power from 1500 ms epochs ( $-200$  ms– $1300$  ms) time-locked to the critical word were analyzed on four frequency bands: theta ( $4$ – $7$  Hz), alpha ( $8$ – $12$  Hz), beta ( $12$ – $20$  Hz), and gamma ( $30$ – $60$  Hz). A two-tailed non-parametric cluster-based permutation test ( $n = 1000$ ) was used to analyze the TF data on each frequency band, comparing the congruent and incongruent conditions. Results revealed that honorific violation conditions elicited a significant P600 compared to the congruous condition ( $p < .001$ ; Figure 1), consistent with prior research on syntactic agreement violations. Additionally, honorific violations were associated with a reduction in beta power ( $12$ – $20$  Hz,  $650$ – $850$  ms,  $p = .004$ ; Figure 2), supporting the hypothesis that beta oscillations play a role in processing social-hierarchical agreement during sentence processing. No other significant effects were observed.

These findings reveal the neural mechanisms underlying subject-verb honorific agreement in Korean. The P600 elicited by honorific violations supports the view that social-hierarchical violations are processed as structural anomalies. The observed beta power reduction suggests a role for oscillatory dynamics in structure building or maintaining cognitive sets, although our results do not distinguish between these interpretations. Future research will explore other morphosyntactic features to evaluate these interpretations and advance our understanding of the interplay between oscillatory dynamics and ERP responses in sentence processing.

1. a) Congruous condition  
Grandpa-nom TV-acc watch-HON-while worked  
'Grandpa worked while watching TV'
- b) Incongruous condition with subject-verb honorific violation  
#Mary-nom TV-acc watch-HON-while worked  
'Mary worked while watching TV'

Figure 1

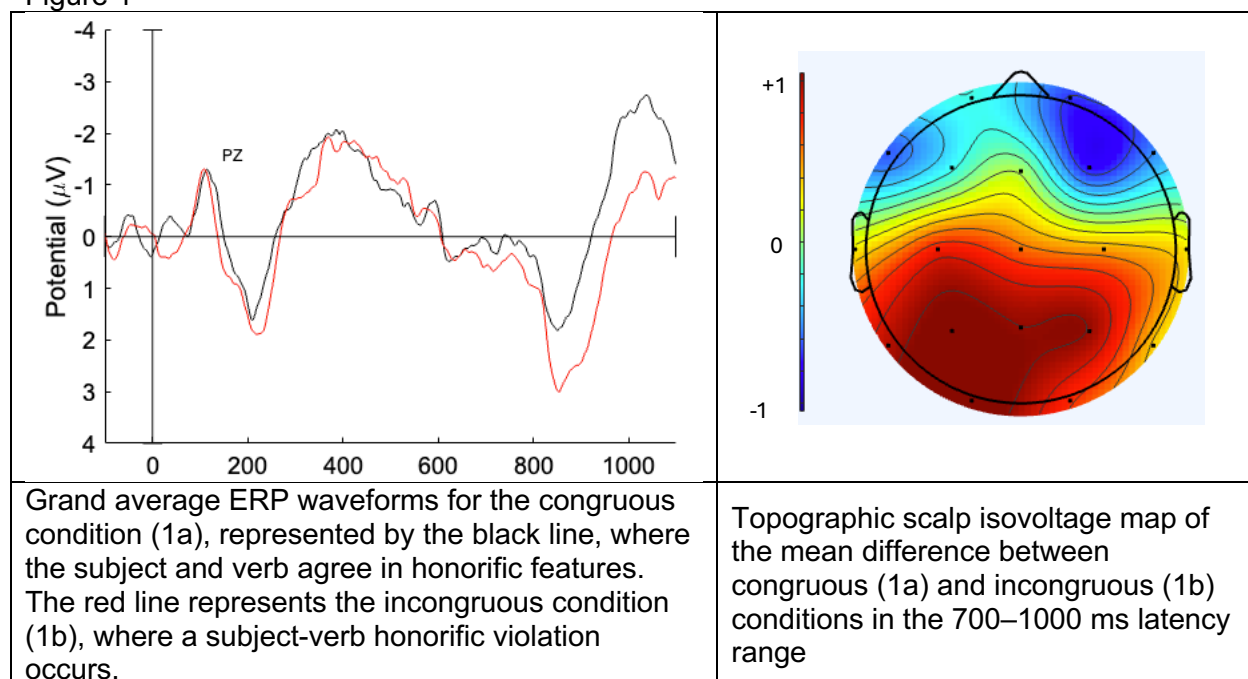


Figure 2

