

Background & Goal

- The N400 is most often characterized as a brain response to the 'semantic incongruity' or 'semantic mismatch' when the current word doesn't 'make sense' in the context. However, recently, there has been heated debate about the functional interpretation of the N400 component, since 'lexical accessibility' is taken to be an additional factor that impacts the N400 amplitude independently.
 - (lexical) Pre-activation / retrieval: Word form features are pre-activated based on contextual information. Processing facilitation during word recognition when pre-activated features are retrieved.
 - (Post-lexical) integration: Word information is integrated with the current mental model. Processing facilitation during meaning integration when information matches the current state of the mental model.
- So far, it has been reported that N400 effect reflecting lexical accessibility or probability appears in the central-posterior distribution ([1]), and N400 due to the integration difficulty is likely to appear in the left-anterior biased area([2]).
- Limitations of previous studies:
 - It remains still unclear whether word and sentence level information interact during sentence comprehension.
 - Critical evidence from head-final languages on the neural characteristics of the N400 reflecting the processing of the lexical or sentence level is largely missing.
- This study investigated the neural correlates of lexical markedness (lexical level) and the truth value (sentence level) and the contribution of these two factors to the comprehension of Korean comparative sentences.

Materials and Methods

Conditions & Materials

- Four experimental conditions were used for the ERP experiment with the truth-value judgment task: The lexical markedness (large / small) of the predicate and the truth value (true / false) of the whole sentence were manipulated. (see [Table 1])
- 198 target items (48 per each condition) + 384 fillers were distributed in 4 sessions.

< Table 1. Experiment materials >

Factors		Condition	Example sentences		
Lexical markedness	Truthvalue		Noun_nomonative marker	Noun_comparative marker	Predicate_decl.
Unmarked (bigger)	True	BT	표범-은 (leopard_top.)	고양이-보다 (cat_compara.)	크-다 (big_decl.)
	A leopard is bigger than a cat.				
Marked (smaller)	False	BF	멸치-는 (anchovy_top.)	돌고래-보다 (dolphin_compara.)	크-다 (big_decl.)
	An anchovy is bigger than a dolphin.				
Marked (smaller)	True	ST	참새-는 (sparrow_top.)	독수리-보다 (eagle_compara.)	작-다 (small_decl.)
	A sparrow is smaller than an eagle.				
Marked (smaller)	False	SF	기린-은 (giraffe_top.)	다람쥐-보다 (squirrel_compara.)	작-다 (small_decl.)
	A giraffes is smaller than a squirrel.				

Participants & Procedure

- 15 (male 8, mean age 24.2) Korean speakers' ERP were recorded at each word
- Visually presented word by word
- 500ms SOA / 500ms ISI
- Truth-value Judgement task at the end of every experiment sentence
- BrainAmp standard amplifier with 32 Ag/Cl electrodes
- 0 - 100 ms baseline / 8 ROIs(midline: Fz, Cz, Pz, Oz / lateral: LA, LP, RA, RP)

Discussion & Conclusion

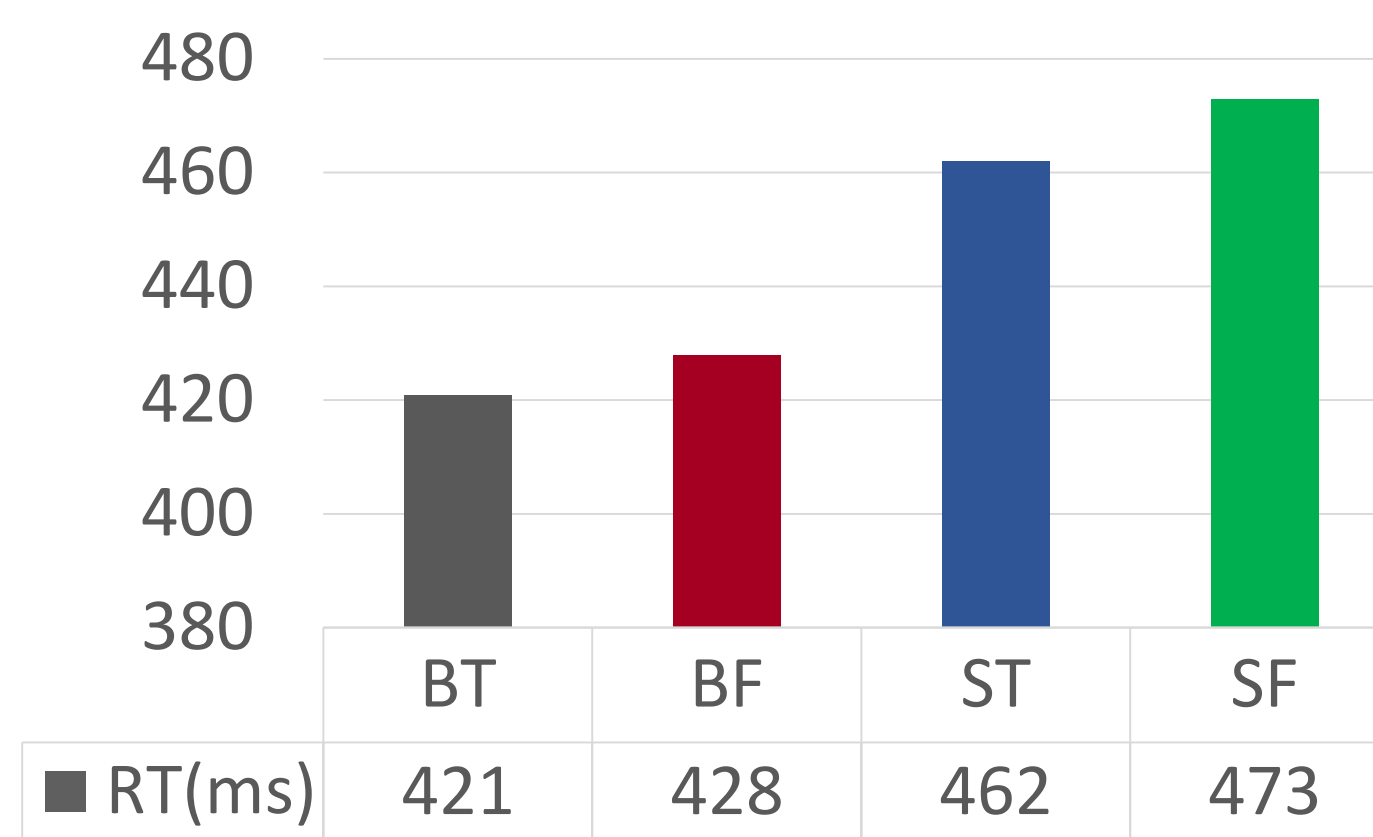
- The N400 can be independently modulated by the facilitated lexical access (as with markedness) and the integration difficulty (as with truth-value).
- In addition, the neuro-cognitive mechanisms engaged in the two linguistic processing might be qualitatively different
 - Lexical markednes effect was elicited in the early time window (250-400ms) and both at the anterior and the midline area.
 - Integration difficulty due to the truth value affected the brain response not only in the early time window (250-400ms) but also in the late time window (400-600ms). However, the direction in the late time window was opposite (positive deflection) & the negativity effect was biased at the posterior area of the brain.
- New ERP evidence from head-final languages is needed, in order to specify the nature of the language-related ERP components more clearly.

Reference

- [1] Van Petten, Luka BJ. (2006). Neural localization of semantic context effects in electromagnetic and hemodynamic studies. *Brain and Language*. 97(3), 279-93.
[2] Lau, E F et al. (2016). A Direct Comparison of N400 Effects of Predictability and Incongruity in Adjective-Noun Combination. *Collabra*, 2(1): 13, 1-19.

Results

Truth value judgment task

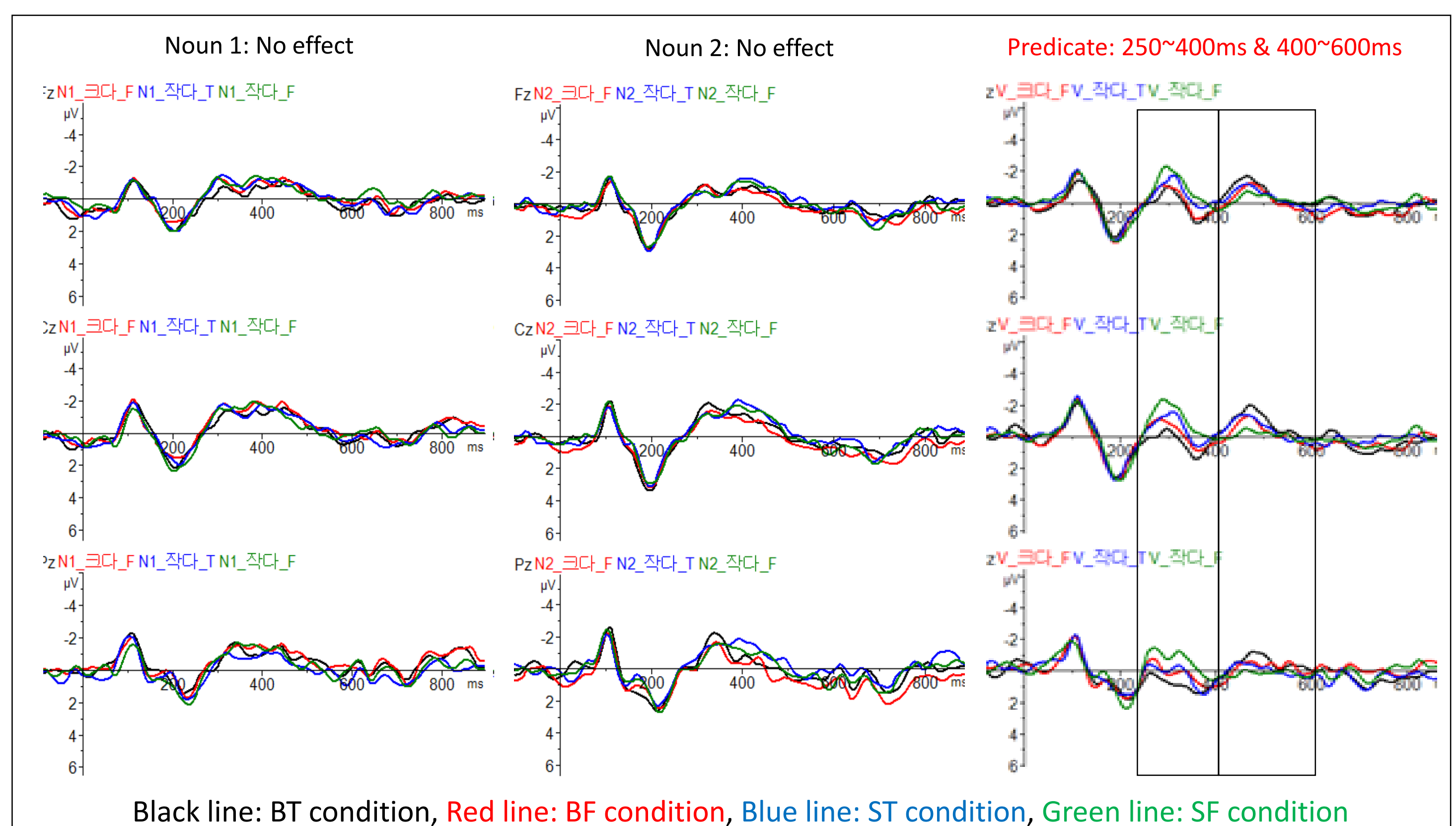


< Figure 1. RT for the truth-value judgment >

- The mean RTs for the truth value judgments showed that only the markedness effect was significant ($F(1,14)=26.542^{***}$) (Figure 1), indicating that the markedness plays a pivotal role in the verification process.
- But neither interaction nor main effect of the sentences' truth-value was observed.

The ERP results

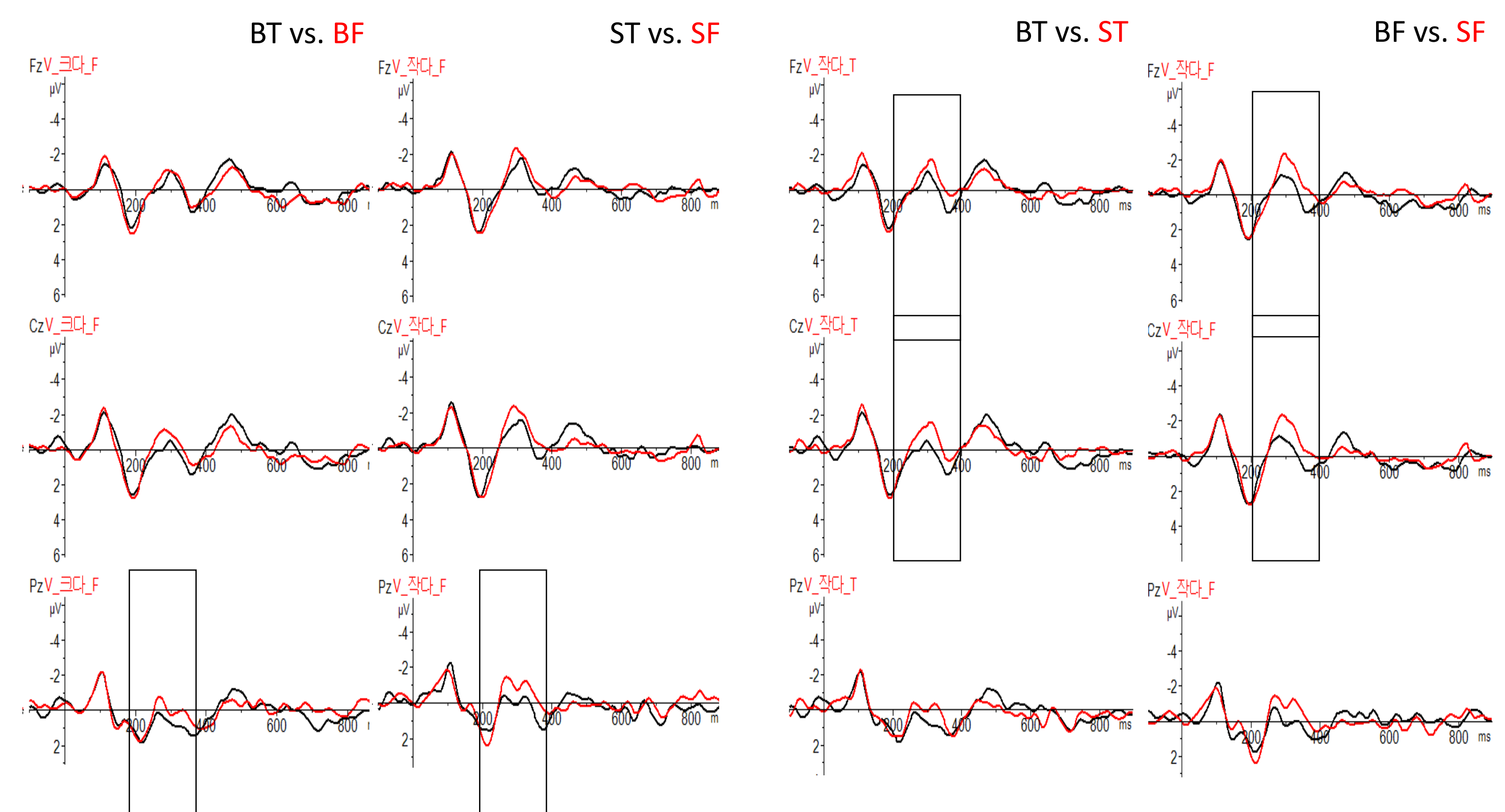
- No differences at Noun 2
- At the predicate position:



- In the 250-400 ms, the negativity effect was elicited in the unmarked condition compared to the marked condition ($F(1,14)=30.897^{***}$) and in the true condition compared to the false condition ($F(1,14)=6.206^*$).
- In the 400-600ms, the positivity was larger in the false than the true condition ($F(1,14)=17.388^{**}$), whereas there was no effect by the markednes.

Truth-value negativity effect: posterior

Lexical effect: distributed over the anterior



- In contrast with the head-initial language, N400 effect reflecting lexical accessibility appears also in the anterior and midline area of the brain but the effect of the integration difficulty is likely to appear in the posterior biased area.