

# Parameters of Grammar and Maturation Effects: an ERP Study on Ergativity and Object-Verb Agreement Processing by Native Versus Nonnative Speakers of Basque

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## Introduction

The extent to which specific aspects of human grammars show maturational effects is still not well known: some studies report Age of Acquisition (AoA) effects [1, 2] whereas others do not

find them for very proficient nonnatives [3, 4]. Here we present an Event-Related Brain Potential (ERP) study on specific grammatical parameters [5] absent in the native language of very

proficient nonnatives: ergativity and object-verb (OV) agreement.

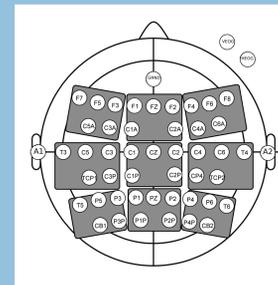
## Methods & Materials

ERPs were registered to determine how natives and very proficient nonnatives (AoA = 3 years) process these grammatical parameters [6]. Spanish, native language of the nonnative group, has no ergative case or OV agreement, so our study controls not only for AoA and proficiency but also for language distance.

17 native Basque speakers and 17 non-native high-proficient Spanish-Basque bilinguals (AoA 3 years) participated in the ERP study. Participants were presented visually with grammatical and ungrammatical sentences containing ergative case and OV agreement, shown in the examples 1(ab) and 2(ab) respectively:

## ERP recording

The data were acquired from 59 electrodes and referenced on-line to the right mastoid and rereferenced off-line to the left mastoid. Electrode impedance was kept below 5 kohm at all scalp and mastoid sites and below 10 kohm for the eye electrodes. The electrical signals were amplified within a band-pass of 0.001 - 50 Hz by a BrainVision amplifier system and digitized on-line at a rate of 500 Hz.



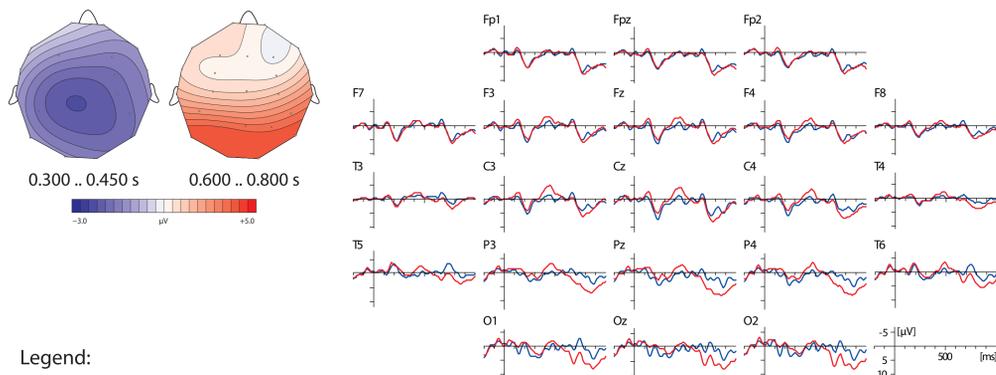
After the stimuli were recorded, the artefact rejection procedure was applied (off-line) when the amplitude (from bottom to top) of the electrooculogram (EOG) was higher than 50 µV or when the saturation was excessive, as well as when the changes of baseline were bigger than 200 µV/s.

- 1a. Goizean ogia erosi du **aitak** dendan. (ergative case, grammatical)  
'This morning bread bought has father<sub>ERG</sub> in the shop'  
This morning father bought bread in the shop.
- 1b. Goizean ogia erosi du **\*aita** dendan. (no ergative case, ungrammatical)  
'This morning bread bought has \*father<sub>Ø</sub> in the shop'  
\*This morning father bought bread in the shop.
- 2a. Zuk ni hondartzara eramaten **nauzu** batzuetan. (OV agreement, grammatical)  
'You<sub>ERG</sub> me to the beach take<sub>PROG</sub> me-have-you some times'  
Sometimes you take me to the beach.
- 2b. Zuk ni hondartzara eramaten **\*duzu** batzuetan. (no OV agreement, ungrammatical)  
'You<sub>ERG</sub> me to the beach take<sub>PROG</sub> \*3person-have-you sometimes'  
\*Sometimes you take me to the beach.

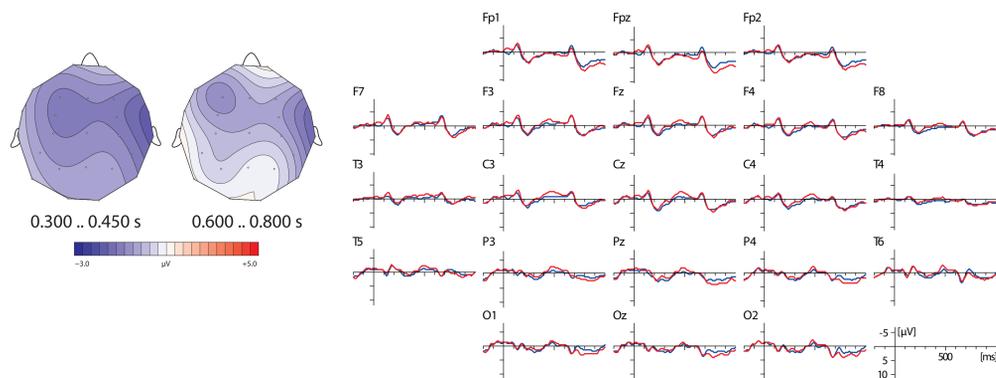
## Results

### ERGATIVE CASE

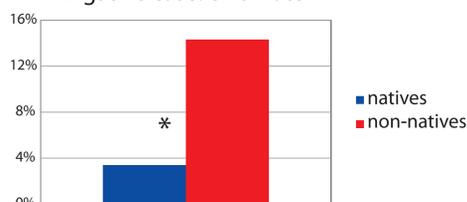
#### NATIVES



#### NON-NATIVES

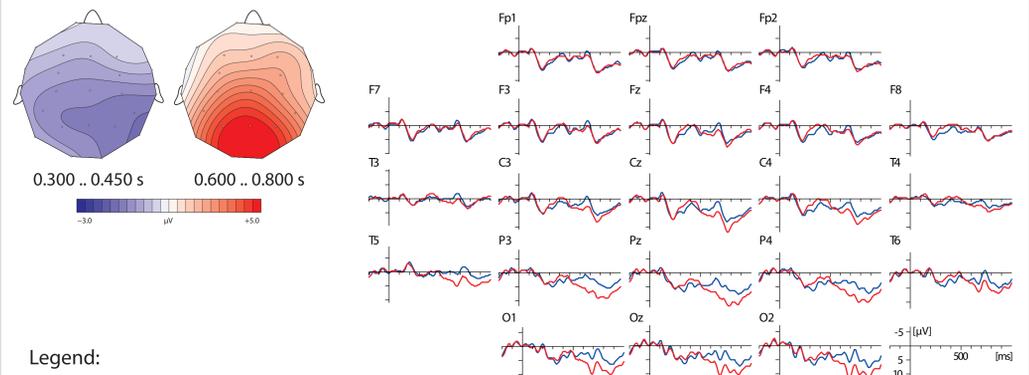


Ergative case: error rate

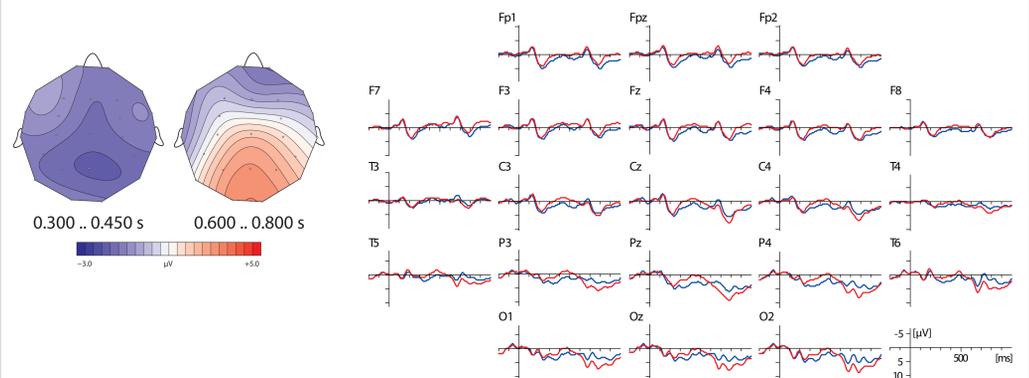


### OBJECT-VERB AGREEMENT

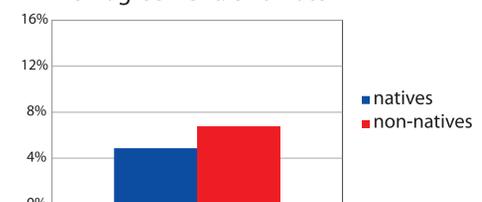
#### NATIVES



#### NON-NATIVES



OV agreement: error rate



## Discussion

ERP data revealed an N400-P600 pattern and no differences in the processing of OV agreement violations across groups. However, nonnatives did not show the P600 component elicited by the native group for ergative case violations (significant GROUP x GRAM x ANT interaction:  $F(2,64) = 5.85, p = 0.014$ ). We thus report maturational effects for one parameter of the grammar but not the other, which suggests that AoA can have an asymmetrical impact, depending on the grammatical parameter at play, independent of proficiency.

## Conclusion

We find a difference in processing between natives and nonnatives in one parameter (ergative case) but not in the other (OV agreement). This suggests that different parameters of grammar may have different acquisition windows, and suggests that AoA versus proficiency studies must carefully control also for language distance.

## References

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