

# Effect of Proficiency on Subject-Verb Agreement Processing in French Learners of English: An ERP study

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## Abstract

This study explored the effect of proficiency on the native-likeness of syntactic processing in a second language. ERP responses to violations of third-person singular subject-verb agreement were obtained from advanced and intermediate adult French learners of English as well as English native speakers. Our findings show a proficiency effect only in early ERP responses to violations, and suggest that the highest level of proficiency attainable through instruction in France is not enough to exhibit entirely native-like responses.

Key words: ERP, L2 processing, syntax, proficiency

## Introduction

Learning a second language (L2) as an adult is a difficult task, which rarely ends in the complete mastery of the target language. One of the factors identified to explain the remaining differences in syntactic processing between late L2 learners and native speakers and among learners is proficiency.

In this study, we recorded Event-Related Potentials (ERPs), which represent changes in brain electric activity triggered by particular events (Fabiani et al., 2000), a method frequently used to study language processing on-line due to its high temporal resolution. Two main components have been identified for the study of syntactic processing: the LAN (Left Anterior Negativity), a negative shift sensitive to difficulties in morphosyntactic processing; and the P600, a centro-posterior positive shift triggered by a large variety of syntactic violations and thought to reflect control and reanalysis processes (Hahne and Friederici, 2001; Tanner et al., 2013). This study explored the effect of proficiency on the native-likeness of syntactic processing in adults having learned an L2 mostly at school. Advanced learners in studies have generally been living in the country for several years; here our population corresponds to typical advanced French students, who have attained the highest level of University education in English but have spent at most an academic year in an L2-speaking country.

## Methods

### Participants

12 English native speakers (NS) as well as 12 intermediate (IS) and 12 advanced (AS) French learners of English took part in the experiment. IS and AS differed in length of University education in English (1 vs 7 semesters), time spent in English-speaking country (< 2 weeks vs 1 year) and scores at a short proficiency test.

### Material and Procedure

The material consisted of 80 short active sentences composed of the pronoun *He*, a verb and a short complement, half of which containing a violation of subject-verb agreement. 80 additional sentences with the pronoun *They* were included to balance the presence of the *-s* morpheme at the end of the verb between correct and incorrect conditions.

A fixation cross appeared first for 1000 ms and remained on the screen during the auditory presentation of the stimulus and for 1000 ms after its end. A screen prompted the participant to evaluate the grammaticality of the sentence by pressing a coloured button and remained for at most 2000 ms.

### EEG data acquisition and analysis

EEGs were recorded with a Biosemi ActiveTwo system with 32 active electrodes, referenced on-line to the two mastoids and re-referenced off-line to the average of the two mastoids. Data were filtered on-line between 0.1 and 100 Hz. Electrode impedance was maintained below 20 Ohms and the signal was sampled at a rate of 512 Hz. Epochs from -200 ms to 900 ms around the critical point (beginning of the word following the violation) were extracted from continuous data. After baseline correction (-200-0 ms), high-pass filtering at 0.1 Hz and low-pass filtering at 30 Hz, trials for which peak-to-peak amplitude exceeded 70  $\mu$ V on the EOG channel or 150  $\mu$ V on the other channels were automatically rejected. Electrodes were divided into central and lateral sites, the latter also divided into anterior/posterior region and left/right hemisphere. The following temporal windows were selected: early (500-700 ms) and late (700-900 ms) P600, and two windows for early negativities (200-300 ms and 300-500 ms).

### Results<sup>1</sup>

A P600 effect was obtained for all groups: in all the windows for NS (500-700 ms, central electrodes:  $F(1,55) = 20.02$ ,  $p < .001$ ), in the late one at central electrodes for AS ( $F(1,55) = 4.83$ ,  $p < .05$ ) and in the early one at lateral

sites for IS ( $F(1,77) = 6.12, p < .05$ ). Additionally, the Condition \* Region interaction was significant for NS at lateral sites ( $F(1,77) = 4.05, p < .05$ ), the effect of Condition being limited to the posterior region ( $p < .001$ ). Between 200 and 300 ms, NS and AS exhibited a significant negativity in the difference wave (NS, central sites:  $F(1,55) = 13.35, p < .001$ ; AS, central sites:  $F(1,55) = 26.81, p < .001$ ), an effect which continued for AS into the 300-500 ms window (central sites:  $F(1, 55) = 45.56, p < .01$ ). For IS on the contrary, a positivity was observed in this window (central sites:  $F(1,55) = 8.65, p < .01$ ). The effect of the Group \* Region interaction was significant in the 500-900 ms window at lateral sites ( $F(2, 99) = 5.41, p < .01$ ), the effect of Group being limited to the posterior region : the P600 effect was larger for NS than AS ( $p < .001$ ) and IS ( $p < .001$ ) (see Figure 1).

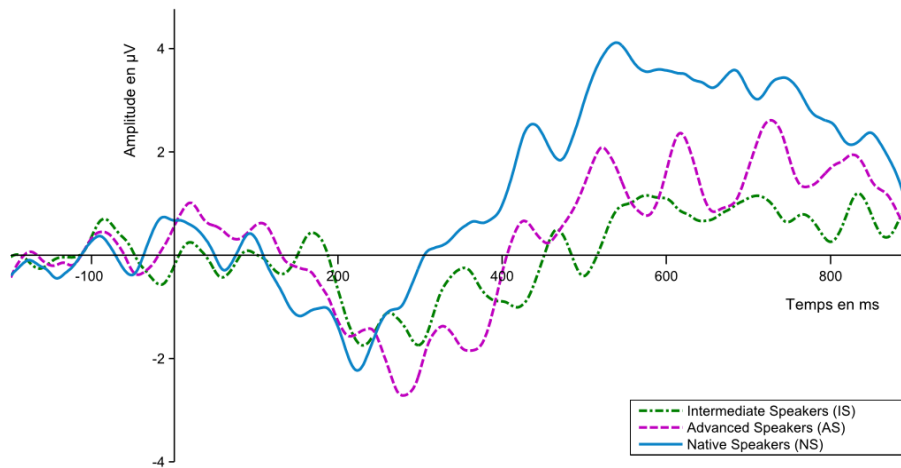


Figure 1. Difference wave (Incorrect – Correct Conditions) at PZ.

## Discussion

This study compared the ERPs evoked in native speakers and French learners of English of advanced and intermediate levels by a syntactic violation working in a similar manner in both languages, namely subject-verb agreement in the third person. A P600 effect was obtained in all groups, but with a larger amplitude for native speakers than learners, even the advanced ones. This difference reflects the difficulty learners experience in reanalysing syntactic mismatches in their L2. Analyses revealed a non-lateralized early negativity in response to agreement violations in native speakers, demonstrating an early identification of a morphosyntactic violation. This negativity was also observed in advanced learners but not in the intermediate ones.

These findings show a proficiency effect only in early ERP responses to syntactic violations but not in reanalysis processes – which have been found to attain qualitative native-likeness as early as after six months of instruction (Osterhout et al., 2006). The fact that the advanced learners in this experiment exhibited a quantitatively non-native-like P600 questions their capacity to attain native-like processing in the L2. However, this ability has been demonstrated before for structures that work in a similar way in the learners' first and second languages, as is the case here (Ojima et al., 2005; Rossi et al., 2006). Since our advanced group had learned English mostly through instruction, our findings are consistent with the claim that a certain – higher – degree of exposure and implicit learning (Morgan-Short et al., 2012) is necessary to show native-like processing of morphosyntactic violations.

## Notes

1. Only analyses with significant results for at least one group are reported. *F* values in tables are reported with the following significance code: \*:  $p < .05$ , \*\*:  $p < .01$ , \*\*\*:  $p < .001$ . Cond. stands for the Condition variable.

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