

Number attraction effects on object-clitic agreement in Spanish: Behavioral and ERP evidence

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Introduction

The number of a local noun included in a modifier to the subject head can interfere with the agreement process resulting in subject-verb number agreement "attraction errors" [e.g., "The key to the cabinets *are...; Bock & Miller, 1991]. Number attraction in subject-verb (SV) relations has been widely studied in language production [Franck, et al., 2006; Hartsuiker et al., 2001] and comprehension [Nicol et al., 1997; Pearlmutter et al., 1999; Wagers et al., 2009], but little is known about the neurophysiological mechanisms underlying these effects in SV agreement.

SV number agreement violations had usually reported LAN/P600 effects [Molinero et al., in press]. In the case of attraction errors, Kaan (2002) observed larger P600 effects in number match than mismatch conditions, while Severens, et al.

(2008) observed a P600 in mismatch and a N400 in match conditions.

Here we investigate for the first time the electrophysiological responses of number attraction effects on object-clitic pronoun agreement. Two main hypotheses have been proposed regarding the nature of clitics: (1) the *Movement Hypothesis*, that assumes that the clitic is generated as an argument and moves to the verb (Kayne 1991) and (2) the *Agreement Hypothesis*, where pronominal clitics and subject agreement morphemes are the same kind of agreement element (Suñer 1988).

Do the same processing mechanisms underly SV and object-clitic agreement?

Methods

Participants: 46 Spanish native speakers

Task: Grammaticality judgment task

Procedure: 48 experimental sentences (12 per condition; see examples 1 and 2) + 120 filler sentences presented word-by-word (350ms + ISI 200ms)

Data analysis: ERPs (32 electrodes, bandpass 0.001-50 Hz, digitalization rate 250 Hz, impedance kept below 5 kOhm) and grammaticality judgment task responses were registered and analyzed.

Materials

MATCH CONDITION (SG-SG)

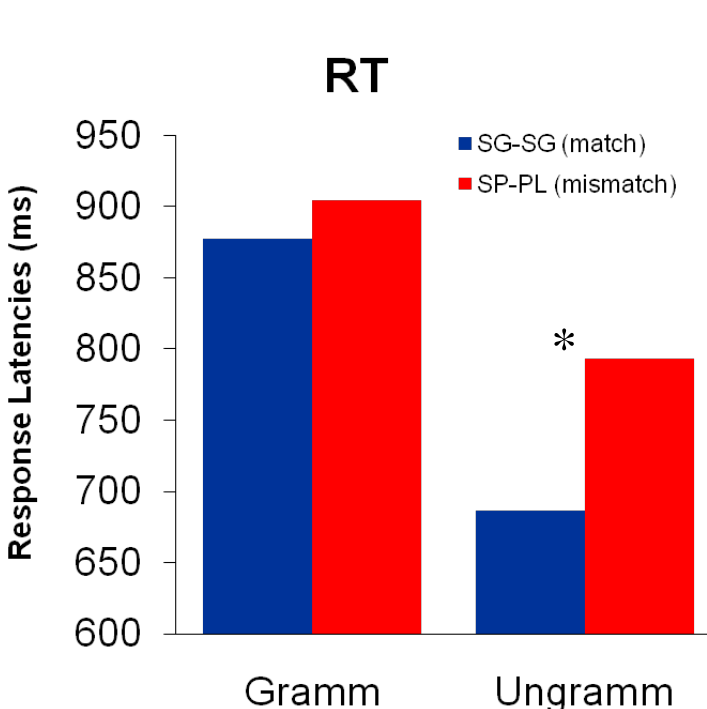
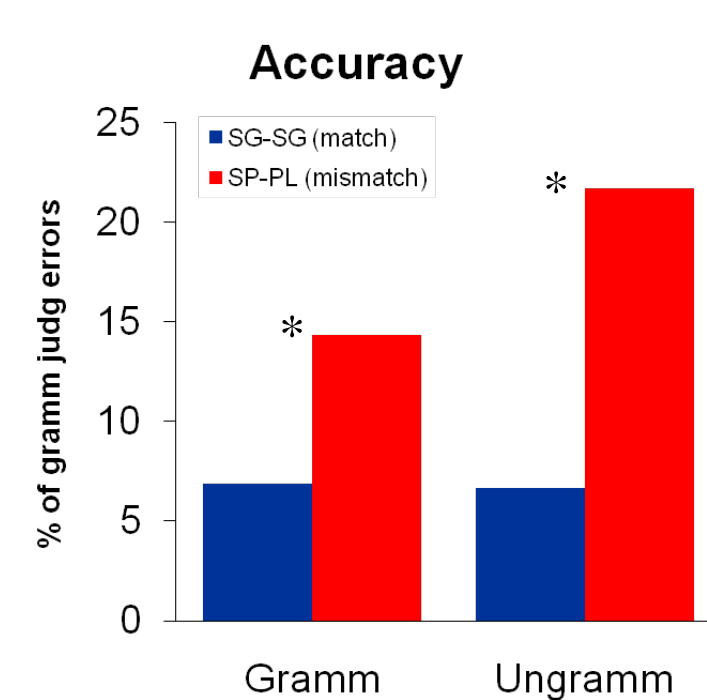
(1a) La pastora dijo que *la casa de la montaña* **la** visitó en invierno. **GRAM**
 (1b) La pastora dijo que *la casa de la montaña* ***las** visitó en invierno. **UNGR**
 the sheperdess said that the house in the mountain, (she) it/*them visited in winter.

MISMATCH CONDITION (SG-PL)

(2a) La pastora dijo que *la casa de las montañas* **la** visitó en invierno. **GRAM**
 (2b) La pastora dijo que *la casa de las montañas* ***las** visitó en invierno. **UNGR**
 the sheperdess said that the house in the mountains, (she) it/*them visited in winter.

Meaning: *The sheperdess said that the house in the mountain(s), she visited it /*them in winter.*

Results

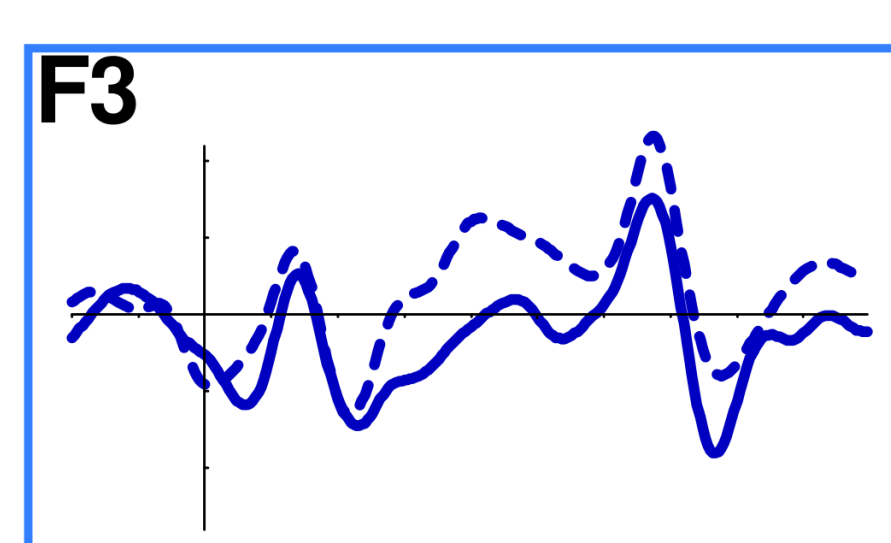
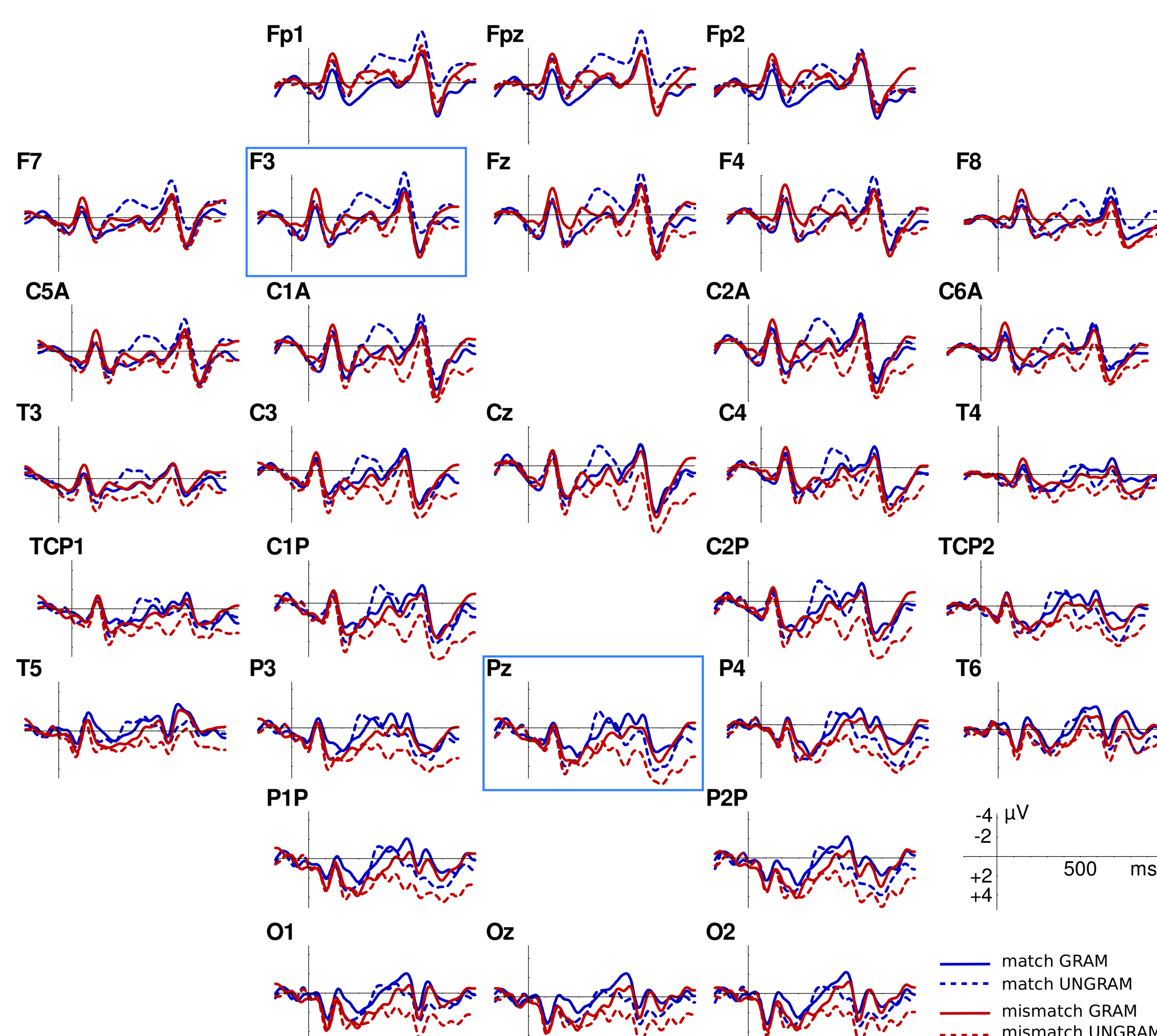


Behavioural results: Participants were significantly slower (only for grammatical) and less accurate (for both grammatical and ungrammatical sentences) in number mismatch than match conditions.

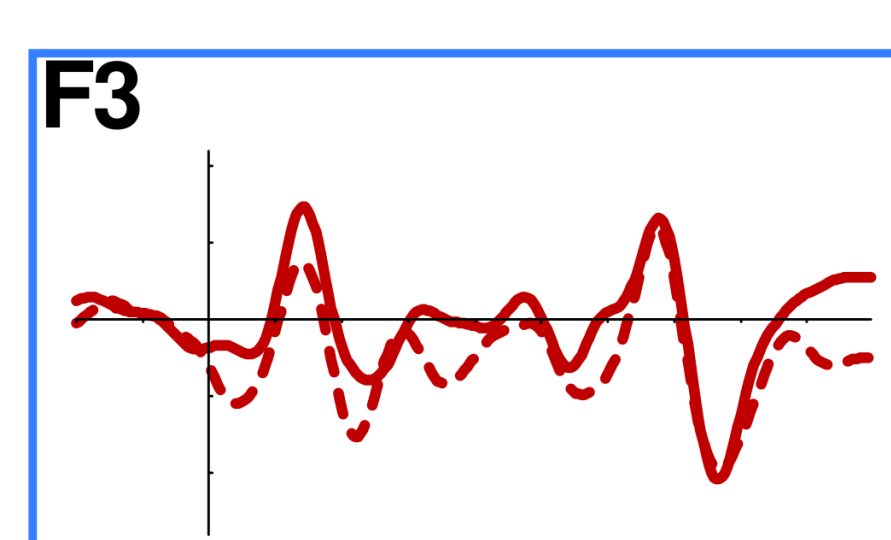
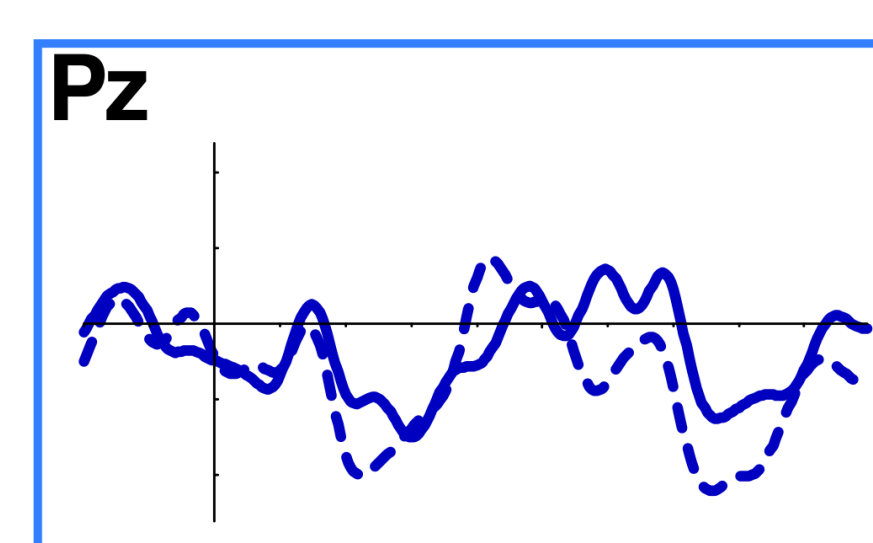
ERP results: At the critical object-clitic position (la vs. *las; 'it' vs.. 'them'), different ERP patterns were found in relation to the **grammaticality effects:**

- **Match conditions:** a fronto-central negativity (bilateral LAN or N400?) followed by a P600.
- **Mismatch conditions:** Only a P600 component.

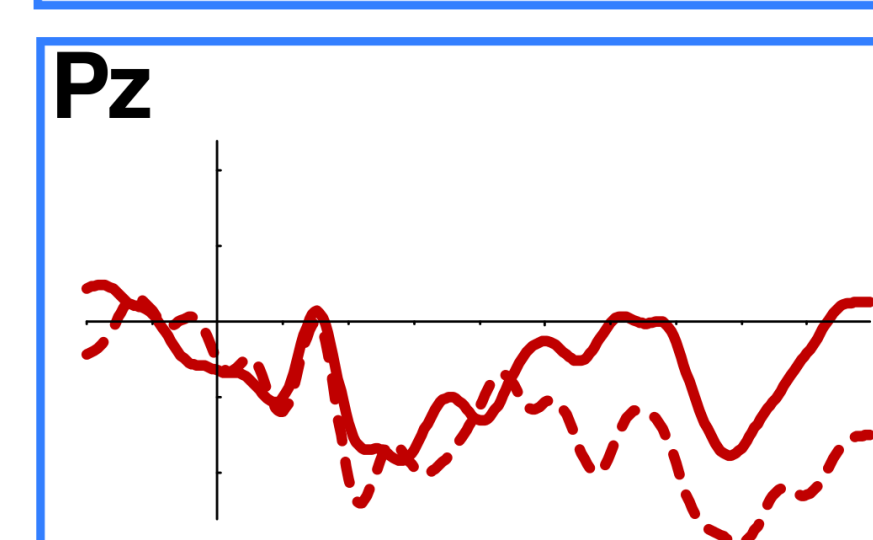
...la casa de la(s) montaña(s) LA/*LAS visitó...



MATCH



MISMATCH



Discussion & Conclusions

Our data suggest that the ERPs related to the encoding of subject-verb and object-clitic pronoun agreement relations are similar: both reveal frontal negativity (LAN/N400?) and P600 components (supporting the Agreement Hypothesis, Suñer, 1988).

Furthermore, similarly to SV agreement, object-clitic agreement is also affected by attraction effects elicited by a number mismatching local noun embedded in the object-NP antecedent (leading to the absence of frontal negativity, contrasting with Kaan, 2002; Severens et al., 2008).

The absence of the frontal negativity in number mismatch conditions indicates that attraction effects have a deep impact on early (considered automatic) stages of agreement computation (e.g., syntactic based expectations, antecedent search), whereas later comprehension processes seem to remain unaffected (e.g., integration of the clitic with the antecedent).

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