The Effects of Anaphor Form and Antecedent Type on Anaphoric Processing

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BACKGROUND

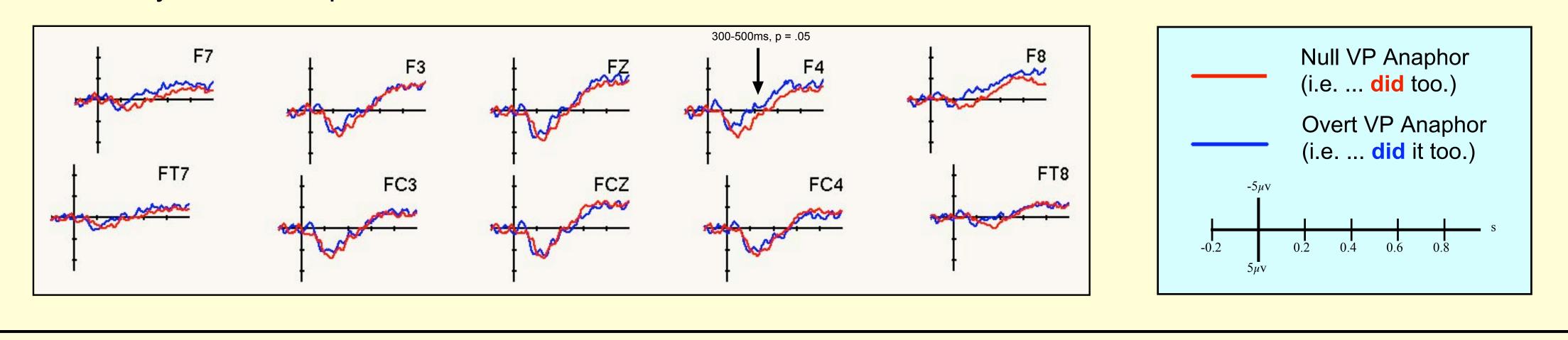### The Informativity of Anaphors

- Anaphors differ in terms of how much information they provide to help the listener in identifying the antecedent (c.f. Ariel, 1990, 1991; Givón, 1983; Murphy, 1985).
- Speakers tend to use more informative anaphors when the antecedent is difficult to identify and less informative anaphors when the antecedent is easy to identify.

Null vs. Overt Anaphors

- Anaphors can be phonetically overt or phonetically null (i.e. unpronounced)   .
- Null anaphors are less informative than overt anaphors because they provide no information about the antecedent.
- During language processing, detecting a null anaphor is more difficult than detecting an overt anaphor because the presence of a null anaphor must be inferred from the surrounding context (c.f. Callahan, 2008).

Previous ERP Studies of Null Anaphors

- An ERP study (Kaan et al., 2004) of gapping constructions involving null verb anaphors (e.g. Ron $took_i$ the planks and Bill e_i the hammer.) found a right anterior positivity between 300 and 500ms post-onset of the word following the null anaphor that was interpreted as reflecting the retrieval of the antecedent.
- Furthermore, an ERP study (Callahan et al., 2007) directly comparing null and overt VP anaphors (e.g. did e_i too vs. did it too) found a right anterior positivity between 300 and 500ms post-onset of the word following the null anaphor relative to that following the overt VP anaphor (see figure below), suggesting that this retrieval process is more costly for null anaphors.
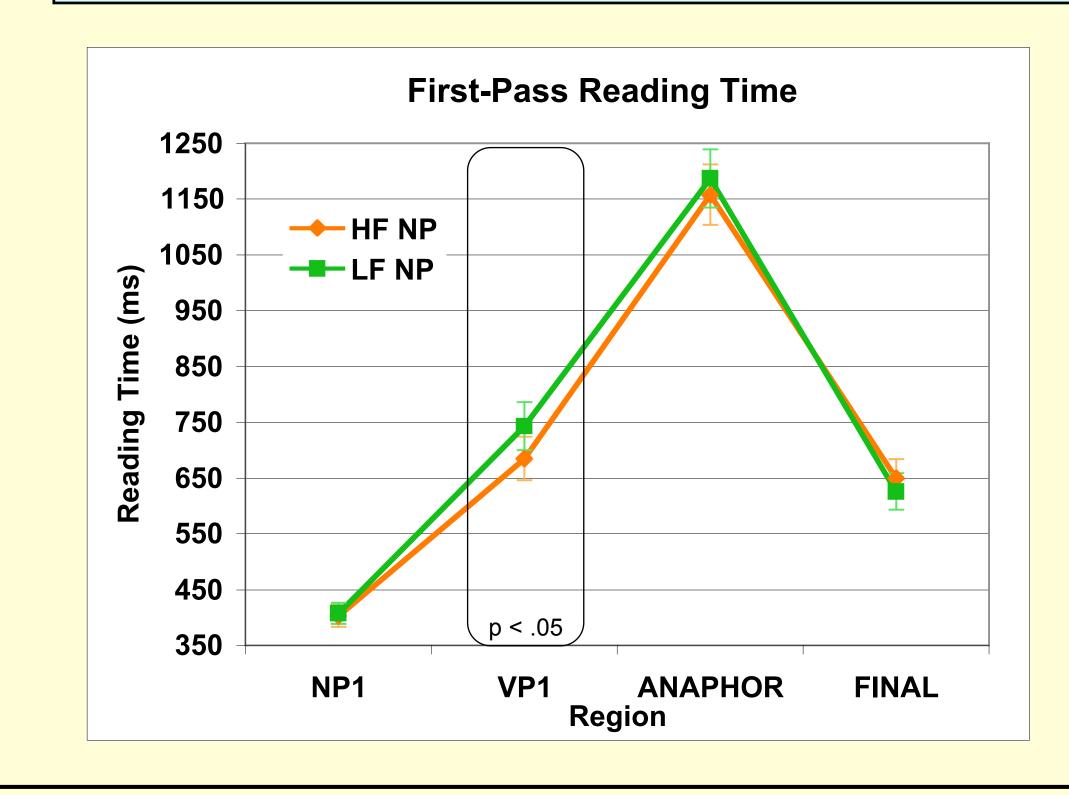

Null VP Anaphor (i.e. ... **did** too.)
Overt VP Anaphor (i.e. ... **did** it too.)

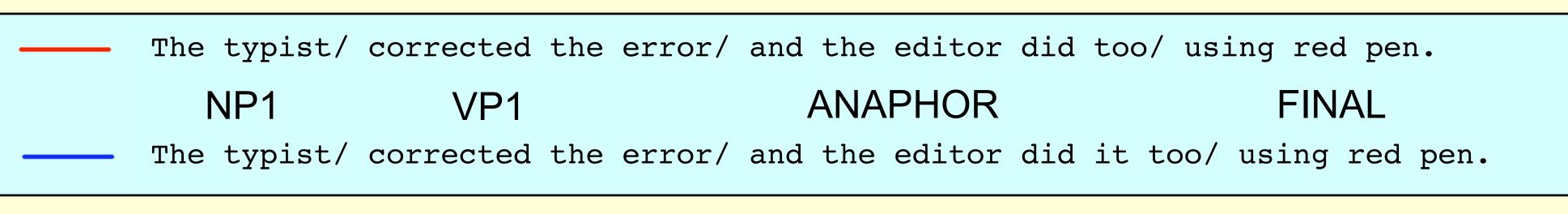## DESIGN AND METHODS

Design and Procedure

- Participants: 35 unimpaired right-handed native English speakers with no early exposure to another language (24 female, 11 male; Mean Age = 21.71, SD = 6.51).
- Task: Participants' eye-movements were recorded while they read sentences for comprehension.
- Materials: 56 experimental items consisting of two conjuncts joined by "and" that appeared in 4 conditions (Null VP Anaphor, Overt VP Anaphor, NP anaphor-High-Freq Object, or NP anaphor-Low-Freq Object). See Results section for sample sentences. 40 filler items, 12 practice items, and 32 comprehension questions were also presented.
- Apparatus: Participants' eye-movements were recorded with a Dr. Bouis oculometer by reflecting a 8.5mA beam of infrared light off the right eye. The distance from the eye to the monitor was approximately 60cm, allowing for single character resolution. A bite plate and headrest were used to minimize head movements.
- Procedure: Sentences were presented as single lines of text on a 21-inch CRT monitor. The eye-tracker was calibrated at the beginning of the experiment and then recalibrated after every 4 trials.
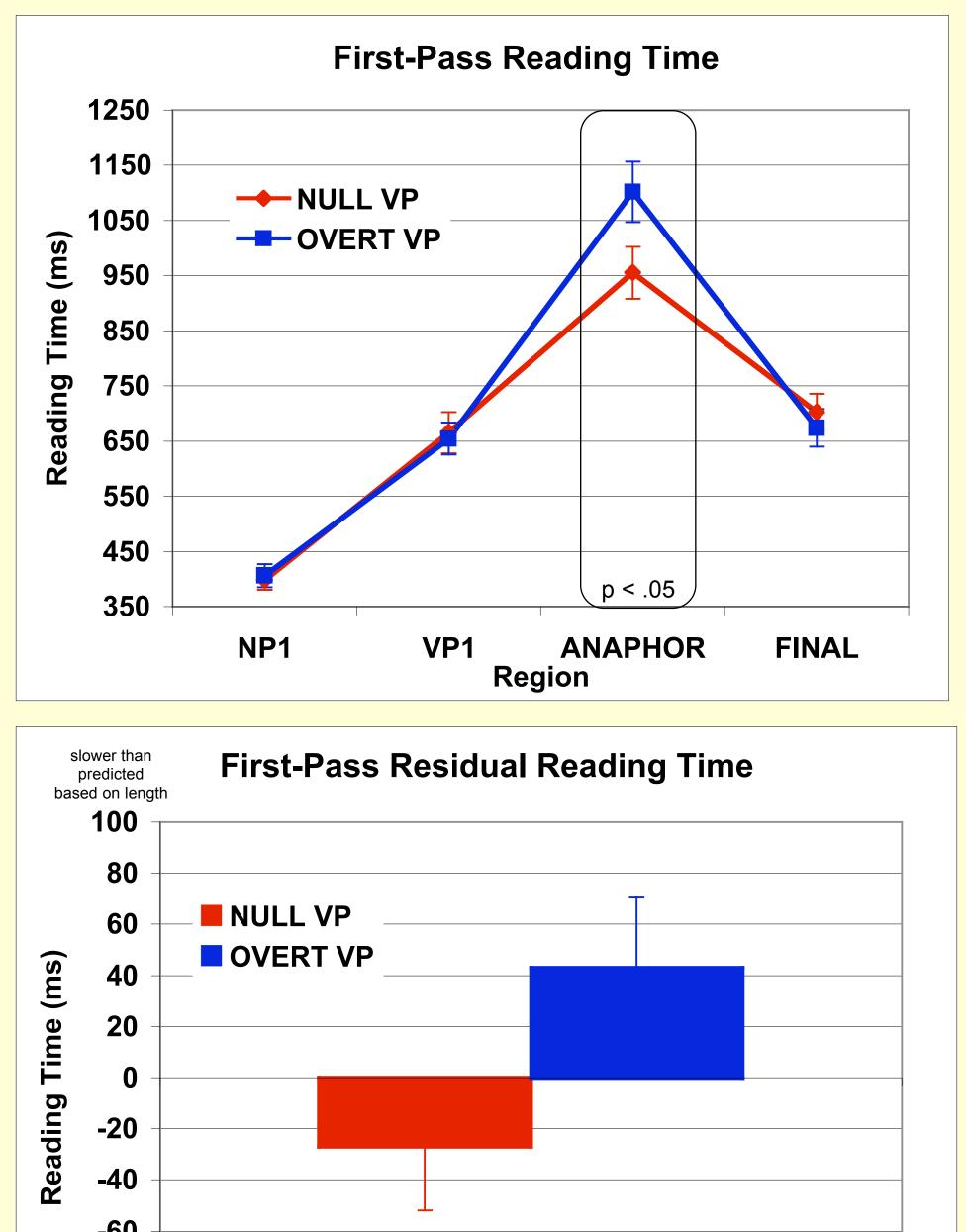
RESULTS- Frequency of Antecedent

The typist/ corrected the error/ and the editor corrected it too/ using red pen.
NP1   VP1   ANAPHOR   FINAL
The typist/ corrected the digit/ and the editor corrected it too/ using red pen.

First-Pass Reading Time

Total Reading Time

RESULTS- Anaphor Form

The typist/ corrected the error/ and the editor did too/ using red pen.
NP1   VP1   ANAPHOR   FINAL
The typist/ corrected the error/ and the editor did it too/ using red pen.

First-Pass Reading Time

Total Reading Time

First-Pass Residual Reading Time

Total Residual Reading Time

DISCUSSION

Effects of Frequency of Antecedent

ANTECEDENT REGION (VP1)

- Longer first-pass and total reading times were observed for the antecedent region (VP1) when the object was low-frequency rather than high-frequency.
- This replicates the standard effect of longer reading times for low-frequency words (e.g. Rayner & Duffy, 1986)

ANAPHOR/FINAL REGION

- Contrary to a previous study (van Gompel & Majid, 2004) that reported shorter first-fixation and first-pass reading times in the region following an anaphor with a low-frequency antecedent, no frequency effect was observed in the anaphor region or the final region.
- The failure to observe a similar effect may be due to the fact that the relevant regions were much larger in this study than in the previous study. Analyses using smaller regions are currently underway.

Effects of Anaphor Form

ANAPHOR REGION

- Longer first-pass and total reading times were observed for the anaphor region when it contained an overt rather than a null VP anaphor; however, raw reading times for this region are confounded by length differences between the null and overt VP conditions.
- Nevertheless, once the length confound was removed by performing the same analysis on residual reading times, the same pattern of longer first-pass and total reading times for the Overt VP condition was observed.
- We tie this finding to evidence from a separate naturalness rating pre-test that suggested that Overt VP anaphors are slightly less natural than Null VP anaphors (where 1=very natural and 5= very awkward, Null VP Mean: 3.5, SD: .70; Overt VP Mean: 3.7, SD: .72).

FINAL REGION

- Of greater theoretical interest, longer total reading times were also observed for the final region of the sentence when it followed a null rather than an overt VP anaphor.
- We tie this finding to evidence from previous ERP studies that null anaphors are associated with increased processing approximately 300-500ms post-onset of the next word.
- Null anaphors may be associated with increased processing load either because retrieval of the antecedent more costly or because null anaphors must be inferred from the surrounding context.

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