



EVENT-RELATED BRAIN POTENTIAL INDICES OF HYPER-ACTIVE GAP-FILLING

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Omaki et al (2011) on “hyperactive gap filling”

BACKGROUND: Omaki, Lau, Davidson, White, & Phillips argue that gap filling is not only active in the sense of Fodor, but “hyper-active”: Gaps are filled before even a verbs’ transitivity property is checked. In a study using English stimuli, they observed reading time disruptions at both the verb and the adverb in both the transitive and intransitive conditions below:

	Intransitive verb: disruption arise from subcat violation	Transitive verb: disruption arise from semantic incongruity
Test: Hyperactive gap-filling	<p>The city that [the author <u>chatted</u> [e] regularly about [e]] was named for an explorer.</p>	<p>The city that [the author <u>wrote</u> [e] regularly about [e]] was named for an explorer.</p>
Control: Gap-filling blocked by Wh-island	<p>The city that [the author [who <u>chatted</u> regularly saw]] was named for an explorer.</p>	<p>The city that [the author [who <u>wrote</u> regularly saw]] was named for an explorer.</p>

AIM OF CURRENT STUDY: The reading time disruptions arise for different reasons: semantic incongruity with transitive verbs, but subcategorization violation with intransitive verbs. The aim of the current study was to test the prediction that different ERPs should accompany the reading disruptions for transitive vs. intransitive verbs.

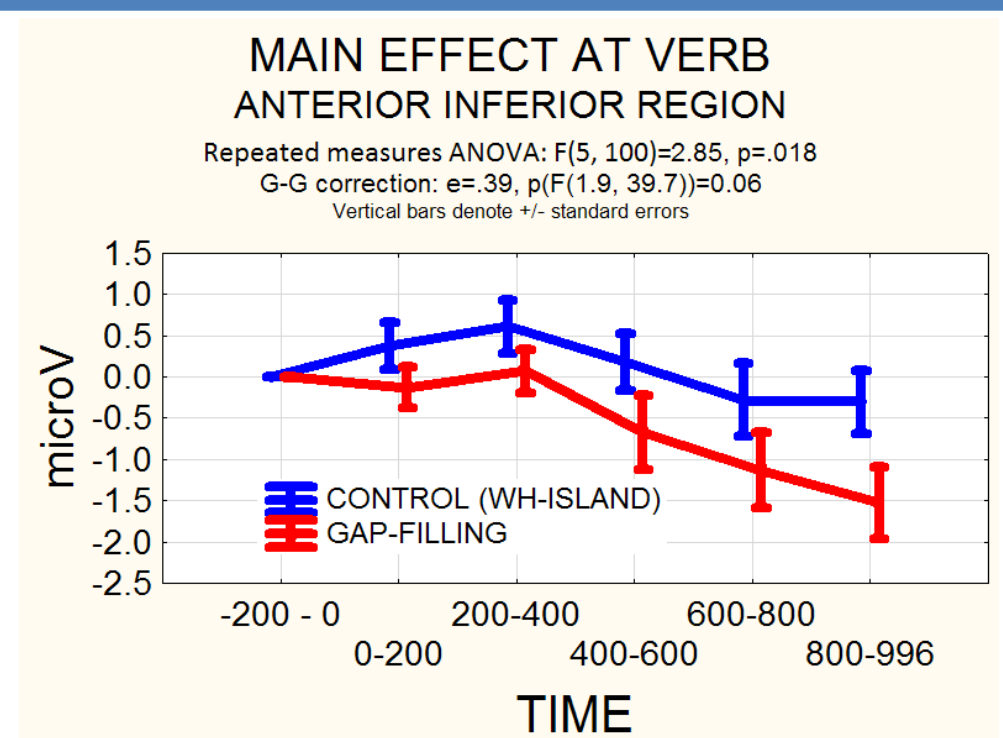
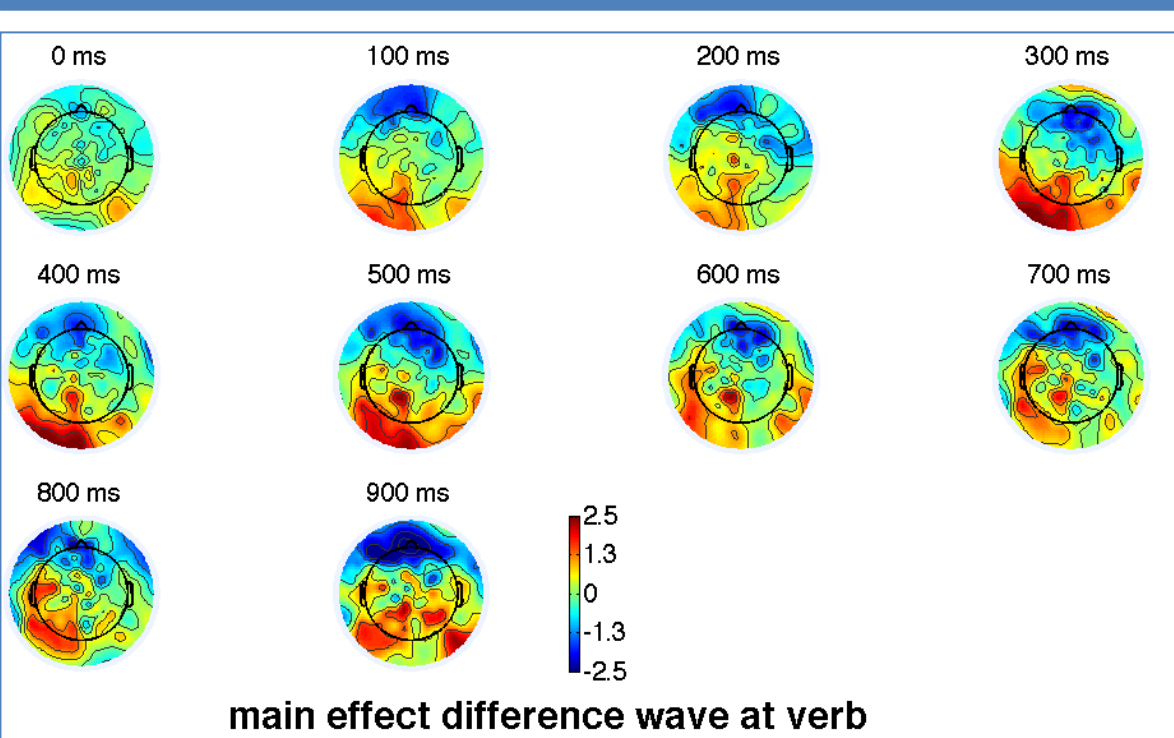
Predictions: Semantic incongruity in the case of transitives (e.g. ?*The author wrote a city*) should elicit an N400, as in Garnsey et al (1989). Subcategorization violations have been observed to elicit a bi-phasic N400-P600 (Osterhout et al. 1994), LAN (Rösler et al. 1993), as well as only N400 (Frisch and Schlesewsky 2001; Frisch et al. 2004). However, we did not expect semantic integration effects with intransitives in the current paradigm. We reasoned that the most likely response would be a P600 caused by encountering an unexpected syntactic category (the relative clause operator trace) after the intransitive verb.

EXPERIMENT: Self-paced reading + ERPs

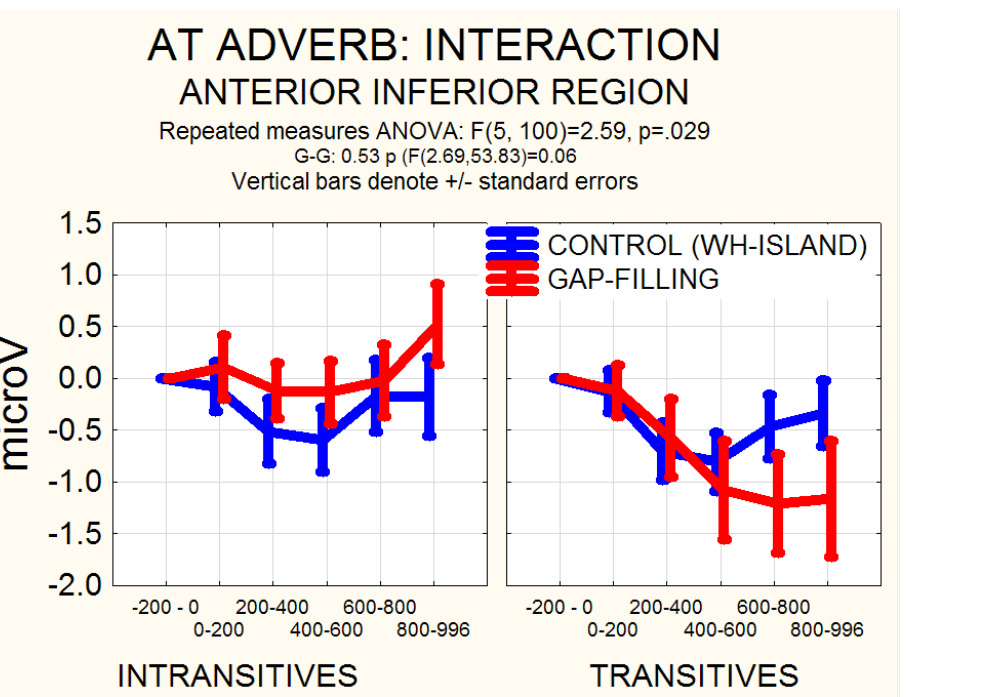
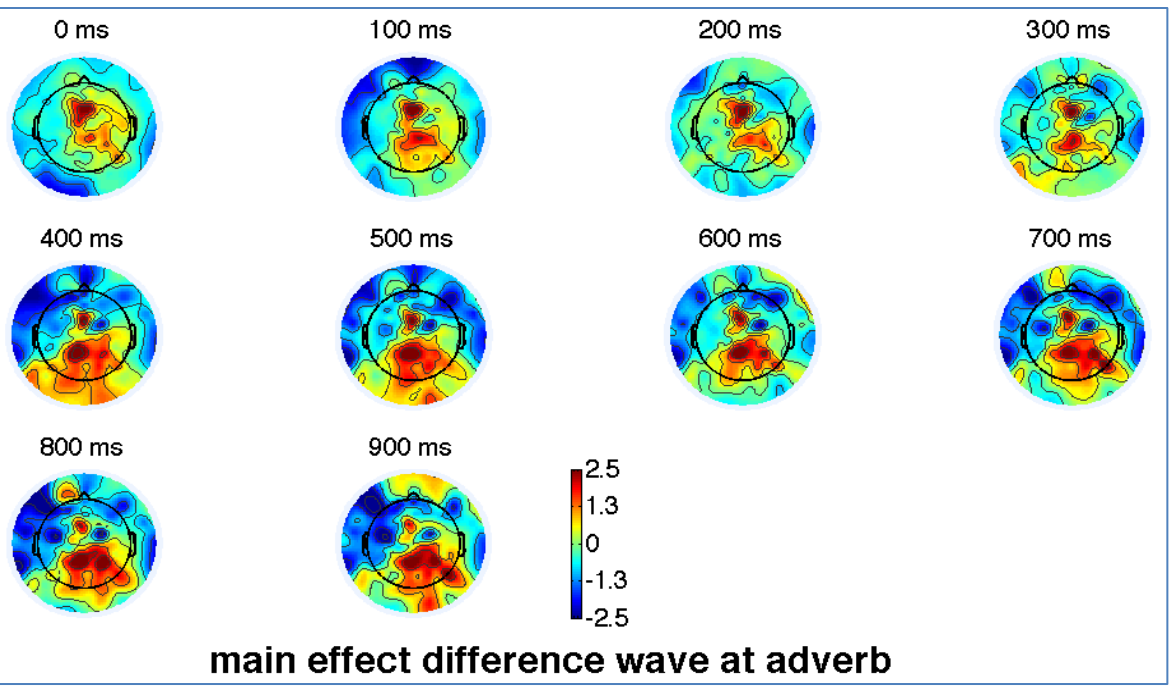
METHOD: 25 University of Delaware undergraduates participated (in return for course credit) in a replication of Omaki et al’s Experiment 1. 4 subjects were rejected due to experimenter error, leaving N=21.

Subjects read 28 sentences per condition and 36 filler sentences word-by-word self-paced. Words were centered on the screen to avoid eye movement artifacts. Subjects answered a comprehension question after each trial (mean: 76%). ERPs were time-locked to the onset of the critical verb as well as the following adverb.

ANTERIOR NEGATIVITY AT VERB AND ADVERB

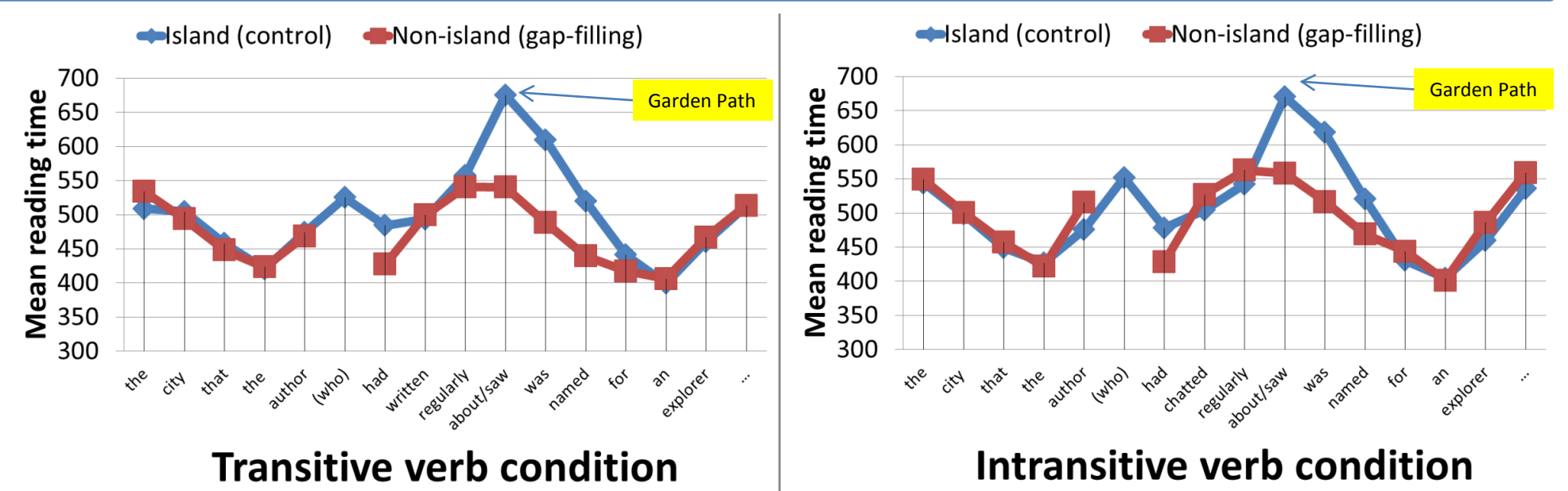


An anterior negativity was observed at the inferior band of electrodes. ANOVA revealed no interaction with laterality. Further analysis of left and right electrodes combined revealed a main effect of gap-filling and no interaction with verb type. Orthogonal contrasts revealed a significant effect of gap-filling in time windows 0-200 to end. **FINDING:** Both transitive and intransitive verbs elicit an Anterior Negativity, indicative of dependency completion at the verb.



ANOVA for all anterior inferior electrodes with a laterality factor revealed no left-right asymmetry. With data collapsed over hemisphere, an interaction with verb type was revealed. Only transitive verbs elicited a significant anterior negativity at the adverb.

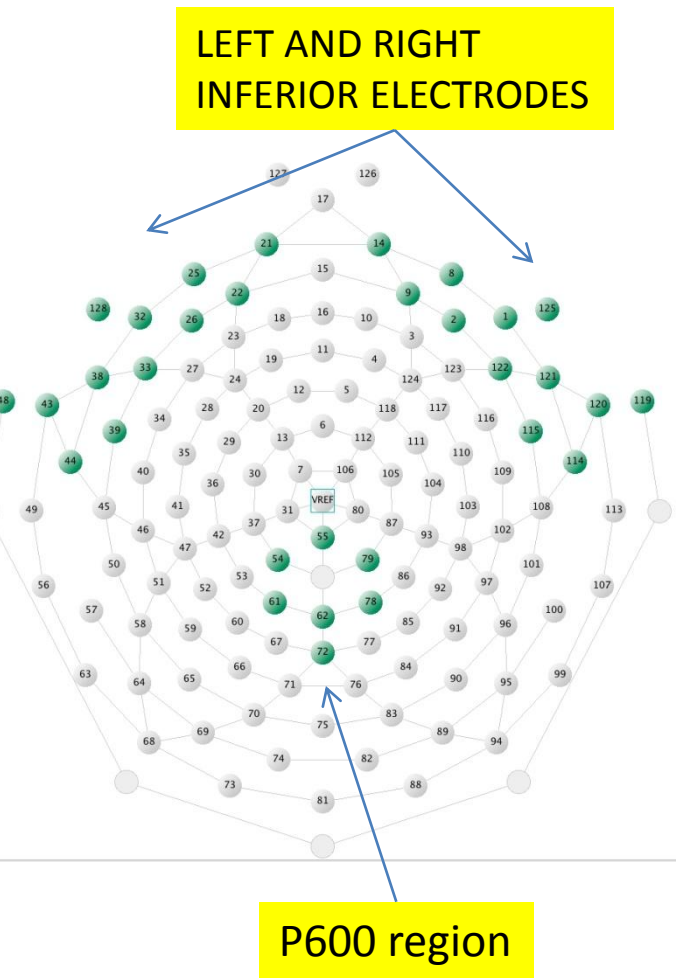
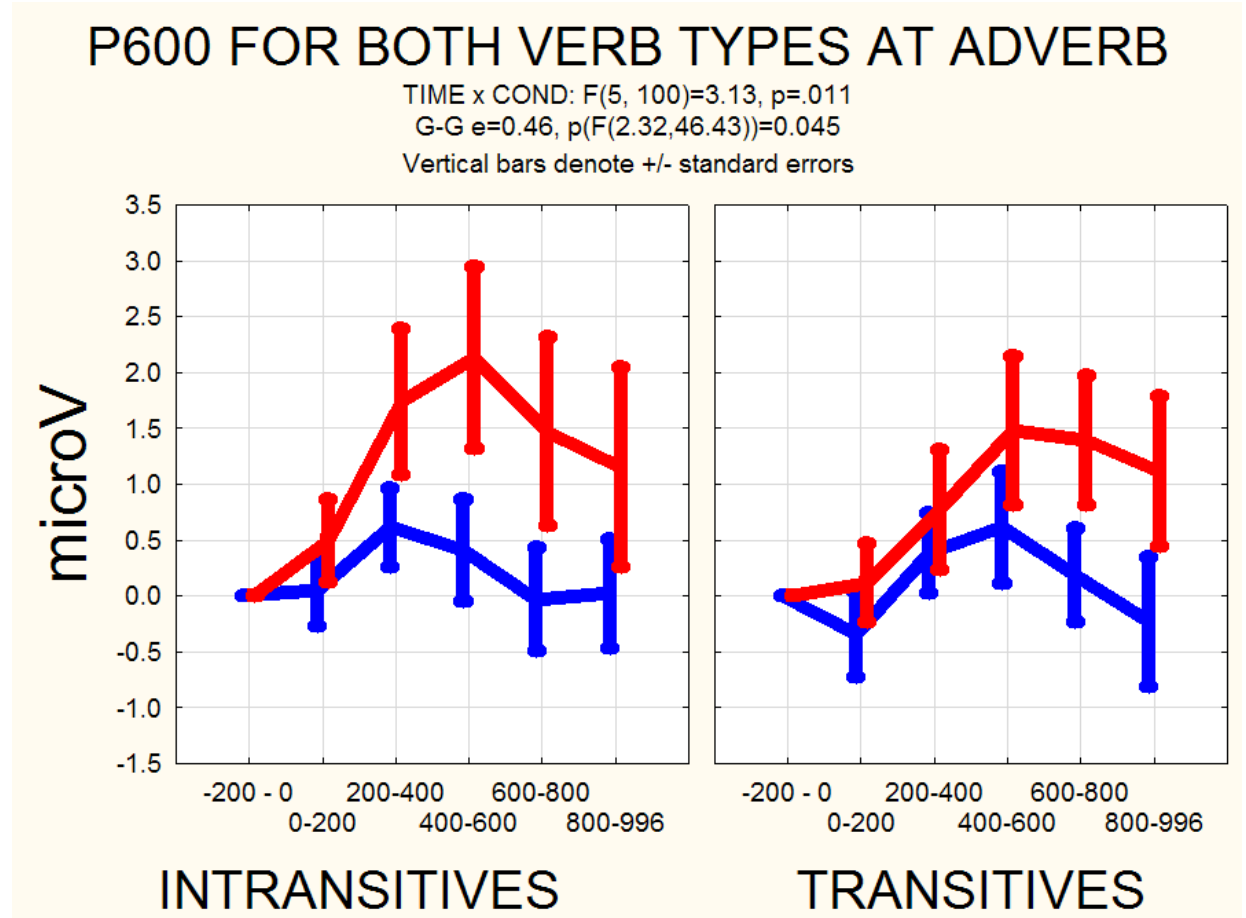
Behavioral results



No reading time disruption was observed at either transitive or intransitive verbs, nor at the adverb spill-over region. A robust (but irrelevant) reading time effect was observed at the Garden Path point in the control sentences (*saw*), so we know that the reading time measure was sensitive to syntactic processing.

P600

Both verb types elicited a P600:



CONCLUSIONS

The study provided mixed evidence for gap-filling after intransitive verbs. Whereas both verb types elicited an anterior negativity at the verb, the effect was descriptively larger for transitives at the verb, and significantly greater at the adverb. Both verbs elicited a P600.

REFERENCE: Omaki, Lau, Davidson White, Dakan, & Phillips. (under revision). Hyper-active gap filling: Pre-verbal object gap creation in English filler-gap dependency processing. Ms.