An ERP study on semantic effects on the processing of adjunct island violations

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In processing filler-gap dependencies (FGDs), comprehenders instigate a search for a gap shortly after encountering the filler. This process is suppressed in syntactic island constructions [1–3], suggesting rapid deployment of grammatical constraints. However, some constructions have debatable island status. Adjunct clauses are described as syntactic islands [4–6]. However, [7] argues that the island status of adjunct clauses varies according to semantic features. For instance, main clause achievement VPs permit a FGD to cross into an activity adjunct clause (*What coffee did you arrive* [*drinking _*]?), but main clause activity VPs do not (?**What coffee did you work* [*drinking _*]?).

[8] investigated whether the semantic features of the main clause VP affected the processing of an FGD resolving in an adjunct. They found increased processing difficulty at the adjunct clause if the main VP was an activity, compared to achievement VPs. They attributed this to difficulty in semantically associating two activity VPs. However, if the main VP was an achievement, and the FGD was a plausible object for the adjunct VP (e.g., *coffee*), they found increased processing difficulty. To explain this, they proposed that gaps are not initially postulated in adjunct clauses. But, comprehenders may selectively reanalyze the sentence to accommodate a gap in this position, increasing processing time.

We understand the proposal by [8] to have two components: (1) semantically associating two activity VPs is harder than an achievement VP and activity VP, and (2) reanalysis occurs for plausible FGDs resolving in adjunct clauses, if the main clause VP is an achievement. The N400 component has been identified as a measure of difficulty in semantically associating a word to a context [9–10]. Thus, we predicted that encountering an activity adjunct VP would result in increased N400 amplitude if the main VP was also an activity. The P600 component is associated with completing FGDs [11,12], detecting island boundaries [13], and reanalysis [14]. We predicted a selective P600 for plausible FGDs resolving in adjunct VPs that attach to achievement VPs. Using ERPs, we show that the effect of ±Extractable and ±Plausible dissociate and interact, as predicted by [8]. However, we do not find this predicted profile.

Experiment. Sixteen (/24 planned) participants read sentences presented at a 500ms SOA in an RSVP presentation style. Electrophysiological responses were continuously recorded using a 32-channel BioSemi EEG cap. In the target stimuli (144 items; 216 fillers), a FGD resolved as the object of an adjunct clause VP (*drinking*). We manipulated whether the filler was a plausible argument for this VP (±Plausible), and whether the main clause VP was an achievement (+Extractable; *arrived*) or activity (–Extractable; *worked*; Fig. 1). For analysis, we conducted ANOVAs at 4 time windows from the critical adjunct verb (*drinking*), with factors ±Extractable × ±Plausible × Laterality (Left, Midline, Right) × Anteriority (Anterior, Posterior), and we conducted repeated measures ANOVAs in the 6 ROIs (Laterality × Anteriority). In the 300–500ms time window, an N400 appeared as a main effect of plausibility ($F(1, 15) = 6.4$, $p = 0.02$) over the midline and right regions (with p-values < 0.05). There appears to be a sustained anterior negativity in the –Extractable conditions. This may reflect continued search for a gap site [15], since –Extractable VPs render the adjunct an island. In the 500–800ms time window, there was a main effect of ±Plausibility in the right posterior ROI 5 ($F(1,15) = 7.32$, $p = 0.02$), and visual inspection suggests a P600 in the –Extractable,+Plausible, unexpectedly. Because

the P600 may index detecting an island boundary, <u>this P600 may reflect a selective construal of adjunct clauses as an island</u>.

	±Plausible		**±Extractable**		
John liked	the coffee the report	that his best friend	arrived worked	at the office	drinking…

Figure 1. Sample stimui from experiment.
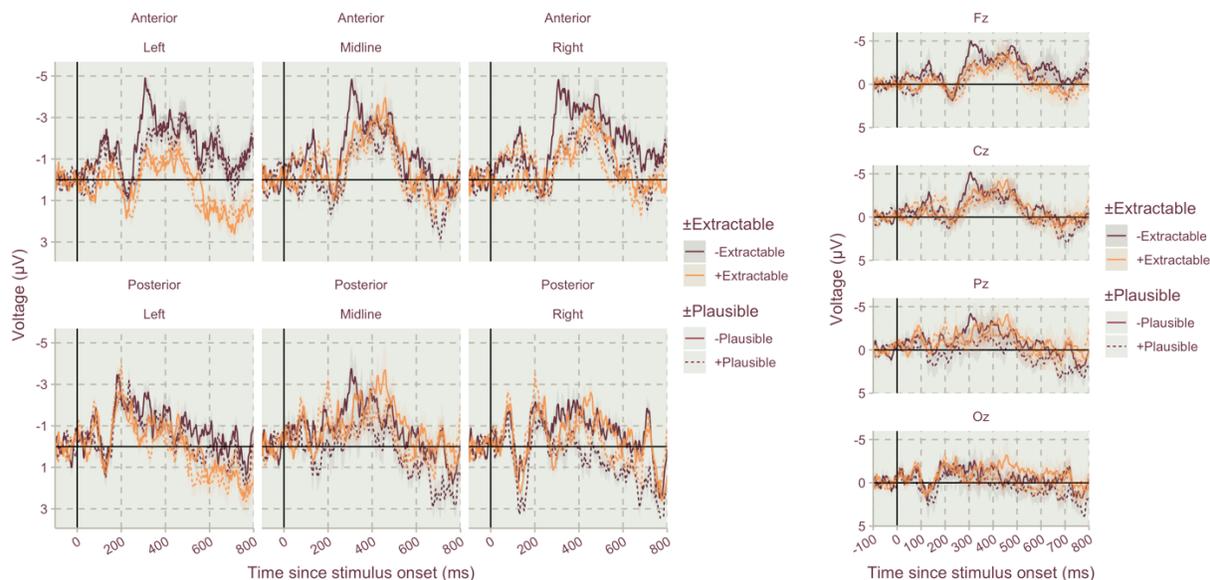
Figures 2–3. (Left) Mean voltage amplitude over the 6 ROIs. (Right) Mean voltage amplitude by condition at midline electrodes. Clouds = one SE from the mean.

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