

Prosodic Phrasing Reflects Semantic Integration

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Introduction

Prosody and Planning

Increasing evidence that prosody reflects real-time linguistic planning (Wagner & Watson, in press).

Planning units and prosodic constituents may be based on semantic units (Selkirk, 1984).

Speakers are unlikely to prosodically separate semantically-related elements, possibly because prosodic structure reflects planning units (Watson, Breen, & Gibson, 2006).

Integration and Planning

Semantic Integration: Elements that are conceptually linked within an utterance are planned with more temporal overlap, increasing the chance of interference and errors (Gillespie & Pearlmutter, 2010; Pearlmutter & Solomon, 2007; Solomon & Pearlmutter, 2004).

Research Questions

- Is semantic integration reflected in the prosodic phrasing of an utterance?
- Are less semantically integrated elements more likely to be separated prosodically?

Experiment 1

Stimuli from Solomon & Pearlmutter (2004; Exp. 4)

Integrated: The sweater **with the tiny** hole(s)
Unintegrated: The sweater **with the clean** skirt(s)
NP PP

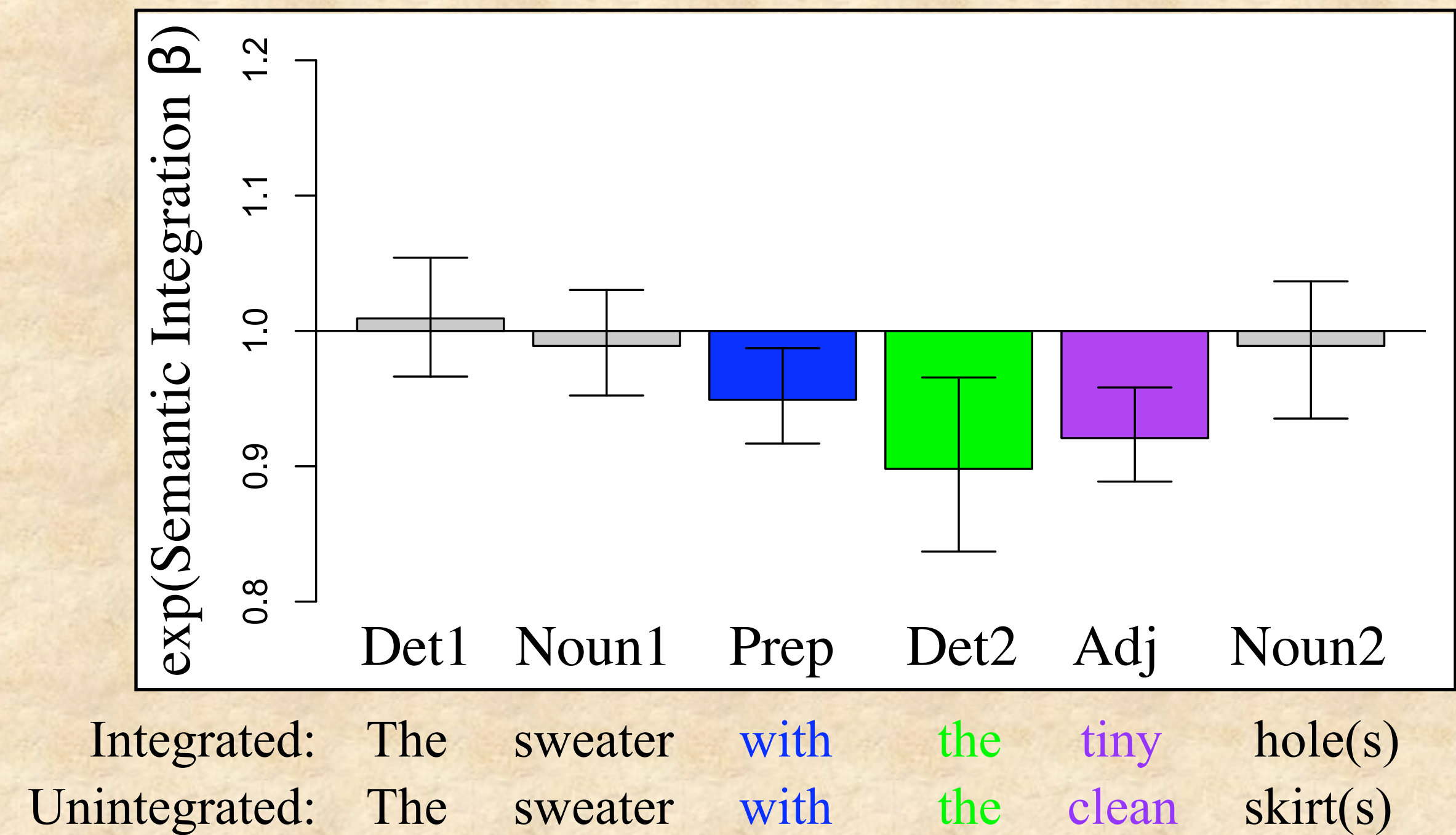
Duration Model

$\log(\text{Duration}) \sim \text{Semantic Integration} + \text{Speech Rate} + \text{Phonological Context} + \text{Predictability/Availability}$

16 speakers x 24 items \Rightarrow 355 useable tokens

Results

Increased semantic integration was associated with shorter word durations for Prep, Det2, and Adj



Discussion

- Temporal separation between nouns reflects integration.
- Likely a processing effect on prosodic phrasing.
- Prosodic phrasing reflects timing of planning predictions from error patterns (e.g., Solomon & Pearlmutter, 2004): lower integration \Rightarrow increased temporal separation \Rightarrow fewer errors.

Experiment 2

Stimuli from Gillespie & Pearlmutter (2010; Exp. 2)

Early Int: The book **with the torn** page(s) **by the red** pen(s)
Late Int: The book **by the red** pen(s) **with the torn** page(s)
NP PP1 PP2

ToBI (Silverman et al., 1992): 13 speakers x 40 items \Rightarrow 441 useable tokens
-Two labelers (1 labeler/token), with similar statistical patterns for both labelers.

Results

Linear mixed-effect model of mean break strength after each constituent

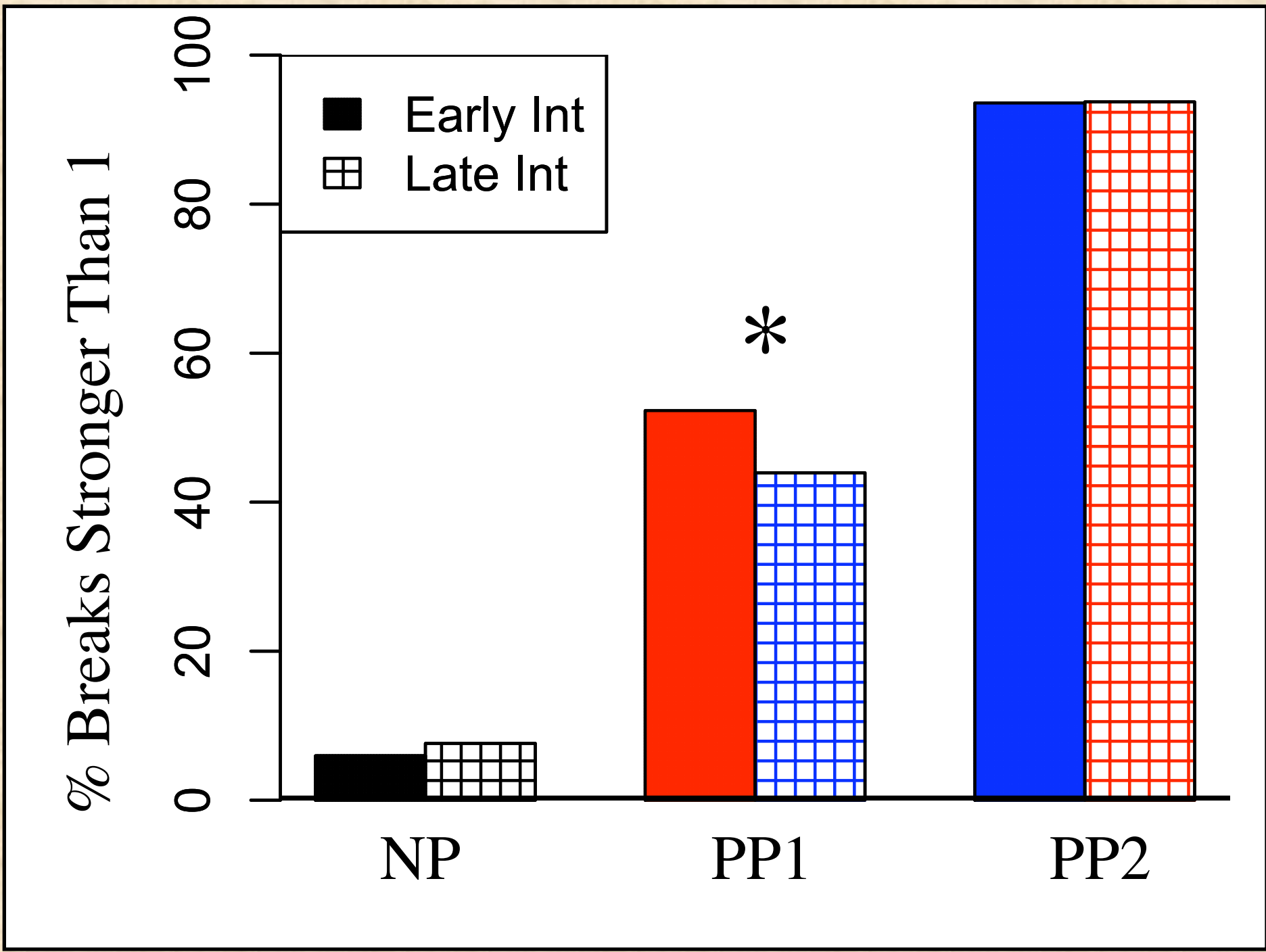
Main effect of position

- NP < PP1 < PP2

Position x Integration interaction

- Early Int NP = Late Int NP
- Early Int **PP1** > Late Int **PP1**
- Early Int **PP2** = Late Int **PP2**

Logistic mixed-effect model of presence of a break stronger than 1 after each constituent



Discussion

- Early Int **PP2** is prosodically separated from NP
- No evidence of prosodic separation of Late Int **PP2** from NP
- Differential break strength after PP1 suggests intended prosodic groupings based on integration.
 - Early Int: NP and **PP1** form a unit and may be separated from **PP2**.
 - Late Int: Prosodic phrase may include both PPs so to avoid separating highly-integrated **PP2** from NP.

Discussion

Semantic integration is reflected in prosodic phrasing.

-Meaning relationships are reflected in prosodic phrasing, both in duration measures and prosodic groupings.

More integrated elements are less prosodically separated.

- High integration has been shown to increase agreement and word exchange errors, suggesting an influence on planning time (Gillespie & Pearlmutter, 2010; Pearlmutter & Solomon, 2007).
 - Prosodic phrasing may reflect integration-based planning differences through word duration and the placement of prosodic breaks.

Open questions

What information affects non-phrase-final lengthening? What information affects prosodic break placement?

Exp. 1 shows evidence of processing demands on the duration of words that are not located at prosodic boundaries, and Exp. 2 may reflect prosodic groupings intended to convey differences in meaning.

How do prosodic phrasing differences due to processing demands and intended prosodic structures combine to create the overall prosodic pattern of an utterance?

How do listeners use these sources of information in comprehension?

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