

Against Hierarchical Distance in Subject-Verb Agreement Production

Maureen Gillespie & Neal J. Pearlmutter
Northeastern University

INTRODUCTION

How are number agreement features tracked during language production?

Mismatch Effect: More subject-verb agreement errors occur when the head noun of the subject NP is singular, and local nouns in PP modifiers are plural, than when local nouns are singular (Bock & Miller, 1991).

Hierarchical Distance: Number features of the head noun of the subject NP are passed to the verb; plural features of local nouns occasionally pass incorrectly to the verb, causing agreement errors.

Franck, Vigliocco, & Nicol (2002):

The **helicopter** for the **flight(s)** over the **canyon(s)**

- **N2** mismatch effect was larger than **N3** mismatch effect.

- Suggests plural local nouns situated hierarchically closer to the verb have a greater chance of interfering with agreement computation than plural local nouns situated deeper in the syntactic tree.

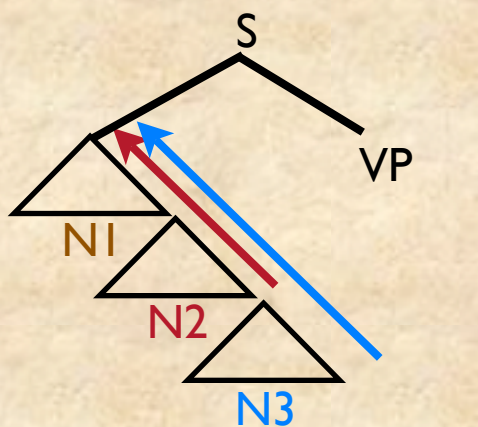


Figure 1. Descending structure

Semantic Integration: Elements within a phrase that are conceptually linked are planned with more overlap, which allows their features to interfere with each other.

Solomon & Pearlmutter (2004):

The **pizza** with the yummy **topping(s)** (Integrated) **N1** **N2** →
The **pizza** with the tasty **beverage(s)** (Unintegrated) **N1** → **N2**

- Integrated mismatch effect was larger than Unintegrated mismatch effect.

- Suggests plural local nouns planned closer in time to the head noun have a greater chance of interfering with agreement computation than nouns planned later.

- Confound: In Franck et al. (2002), **N1** and **N2** were more integrated than **N1** and **N3**; thus, semantic integration is an alternative explanation for Franck et al.'s (2002) results.

Linear Distance to Head: Local nouns appearing closer to the head noun may interfere with agreement computation more than local nouns appearing farther from the head noun.

- Not previously tested, but could be an alternative explanation for Franck et al. (2002)'s results.

GILLESPIE & PEARLMUTTER (2008)

Are there effects of semantic integration or linear distance to the head (controlling hierarchical distance)?

Early-Integrated

The **book** with the torn **page(s)** by the red **pen(s)**

Late-Integrated

The **book** by the red **pen(s)** with the torn **page(s)**

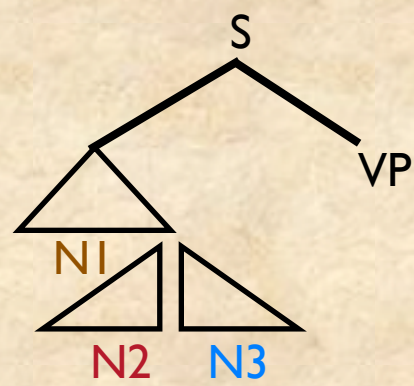
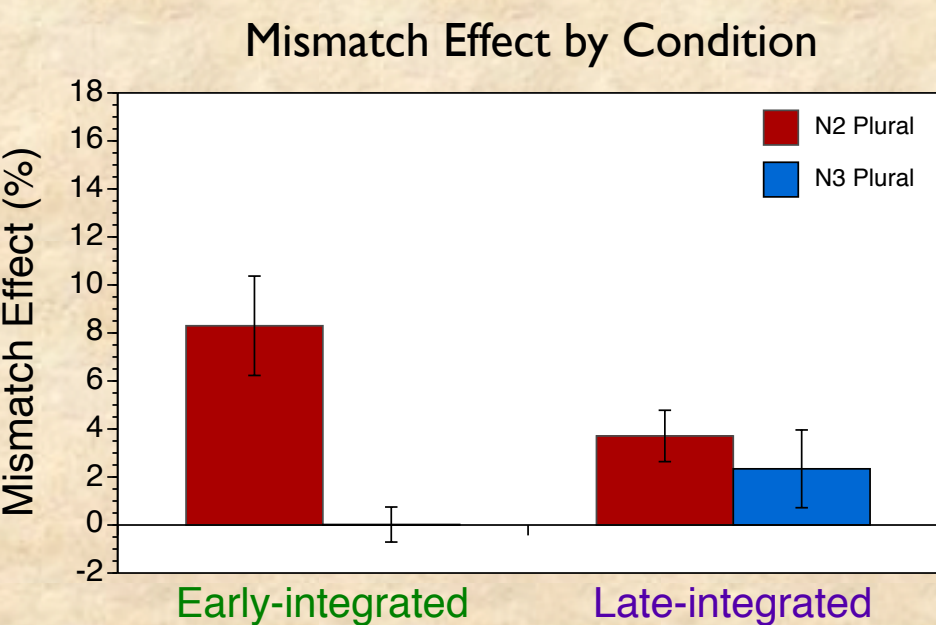


Figure 2. Flat structure



- **Early-Integrated:** **N2** > **N3**; cannot be Hierarchical Distance alone.

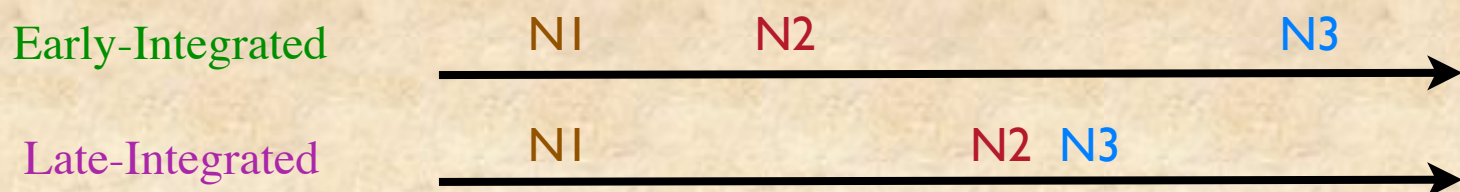
- **Late-Integrated:** **N2** = **N3**; cannot be Linear Distance to Head alone.

- **Early-Integrated** **N2** > **Late-Integrated** **N3**; cannot be Semantic Integration alone.

Proposed alternative

Scope of Planning : Local nouns planned closer in time to the head noun are more likely to interfere with agreement computation.

- More semantically integrated local nouns are planned closer to the head noun.
- Order of production determines order of planning.



Implications for hierarchical distance

- Hierarchical distance is not sufficient to explain mismatch effects.
- Hierarchy still may be involved in agreement computation, because preambles have flat structure.

CURRENT EXPERIMENT

Is there any effect of hierarchical distance (controlling semantic integration)?

Method

Flat Structure (Figure 2)

The **highway** to the western **suburb(s)** with the steel **guardrail(s)**

Descending Structure (Figure 1)

The **backpack** with the plastic **buckle(s)** on the leather **strap(s)**

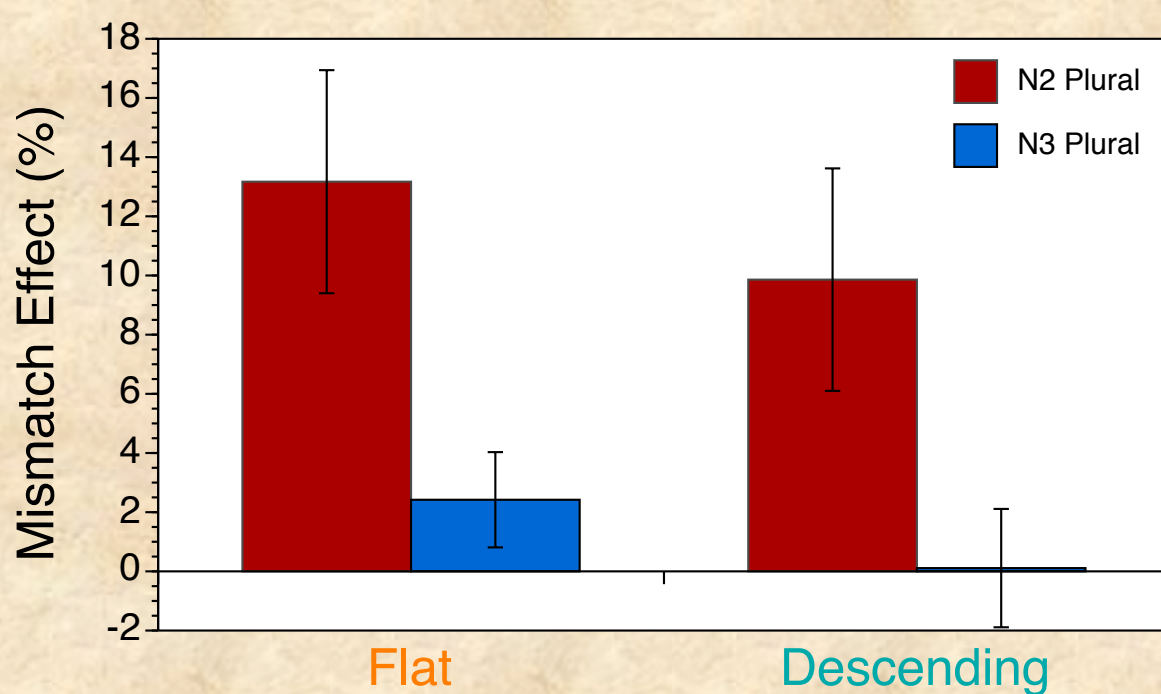
- Preambles equated semantic integration of **N1-N2** and **N1-N3** across structure (see Norming)
- Singular vs. plural local nouns; head noun always singular
- No preambles where **N2** and **N3** were both plural

- 53 participants
- 24 critical items (half **Flat**, half **Descending**)
- 88 fillers (8 singular head with **N2** and **N3** plural, 32 NP PP PP plural head)

- Preambles presented visually; participants read aloud and complete as full sentences.

- If Hierarchical Distance has an effect, difference between **N2** and **N3** mismatch effects should be smaller for **Flat** than **Descending** structures.

Results



- **Flat** = **Descending**

- **N2** > **N3**; suggests Linear Distance to Head is a factor.

- No interaction of plural position and structure; rules out Hierarchical Distance.

Summary

- Controlling semantic integration, only linear distance to the head affected mismatch effects.
- Hierarchical distance does not affect agreement computation.

DISCUSSION

Models of agreement computation may not require a hierarchical component.

Combination of linear distance to the head and semantic integration can explain results of Franck et al. (2002), Gillespie & Pearlmutter (2008), and the current experiment.

Marking & Morphing (Eberhard et al., 2005)

- Measure of a local noun's planning overlap with the head could be used to predict a local noun's influence on agreement computation.
- Makes use of temporal, sequential nature of language production.
- Does not require entire structure of subject NP to be in place to compute agreement.

NORMING

	Semantic Integration Rating			%N1 Attachment
	N1-N2	N1-N3	N2-N3	
Flat	4.10	5.11	2.68	93.3
Descending	4.15	5.16	4.30	4.8
Mean	4.12	5.14	3.50	49.0

Note. Semantic integration scale was 1-7, with 7 = highly integrated. %N1 attachment is the % attachment of the second PP to N1 (vs. N2).

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