Investigating Semantic Integration's Effect on the Functional and Positional Levels of Grammatical Encoding During Production

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INTRODUCTION

How deeply into grammatical encoding does semantic integration penetrate?

Semantic Integration
Degree of conceptual-level relatedness between utterance elements to be planned
Reflects how closely linked parts of a message are

Solomon & Pearlmutter (2004)
Integration effects on subject–verb agreement errors in sentence completions:

| More integrated preambles | **vs.** | Less integrated preambles |
| *The pizza with the yummy toppings* | | *The pizza with the tasty beverages* |

Subject–verb agreement errors more likely for more integrated preambles

Pearlmutter & Solomon (2007)
Integration effects on exchange errors in picture descriptions:

| More integrated phrases | **vs.** | Less integrated phrases |
| *The spot on the apple* | | *The shelf above the sink* |

Exchange errors more likely for more integrated pictures

Degree of integration affects timing of planning:
Increased integration → increased temporal overlap → higher error rates

How does semantic integration affect the functional and positional levels of grammatical encoding (Bock & Levelt, 1994)?

Functional Level
Lexical selection and grammatical function assignment
All phrase exchanges happen at this level.
Word exchanges can happen at this level.

Positional Level
Constituent assembly
Word and morphological slots ordered
Word exchanges can happen at this level.

Intended response
The spot on the apple

Phrase exchange
The apple on the spot

Word exchange
The apple on the spot

Word exchanges or phrase exchanges? Unclear whether functional or positional level was affected

Goals
- Replicate integration effects on error rates
- Determine which processing levels are affected by examining pattern within phrase and word exchanges separately

Prediction
Exchange errors more likely in integrated than in unintegrated conditions, at each level affected by integration

EXPERIMENT 1

Method
36 pictures featuring an object and attribute or two common objects
Varied in integration level and description preference

18 integrated pictures
Preferred
The green spot on the blue apple
Unpreferred
The blue apple with the green spot
Flexible
The green spot and the blue apple

18 unintegrated pictures
Preferred
The red shelf above the green sink
Unpreferred
The green sink below the red shelf
Flexible
The red shelf and the green sink

Differentiable word and phrase exchanges

Target response
The green spot on the blue apple

Phrase: **The blue apple** on **the green spot**
Noun: *The green **apple** on the blue **spot***
Adjective: *The **blue** spot on the **green** apple*

Two familiarization phases
Black-and-white version of each picture presented with noun labels below it.
Ss instructed to focus on/learn labeled parts of pictures.

Test phase
Colored version of each picture appeared.
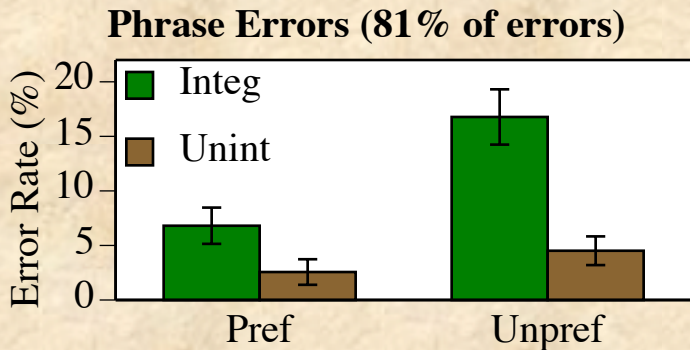Linking word appeared below—**2000 ms SOA**.
Ss described pictures using noun labels, color words, and linking word.

100 original Ss, 14 excluded for too many unusable trials

Results
95% of errors were phrase errors; only phrase errors analyzed
Exchange error rate = Exchanges/(Exchanges + Correct Responses + Close Matches)

Phrase Errors (81% of errors) — Integ / Unint — Pref, Unpref

Word Errors (5% of errors) — Integ / Unint — Pref, Unpref, Flex

Integrated > Unintegrated
Unpreferred > Preferred
Integration x Preference interaction (marg. by Items)
Replicates Pearlmutter & Solomon (2007; Exp. 1)

- Integration effect on rate of phrase exchange errors
- Functional level affected by integration.
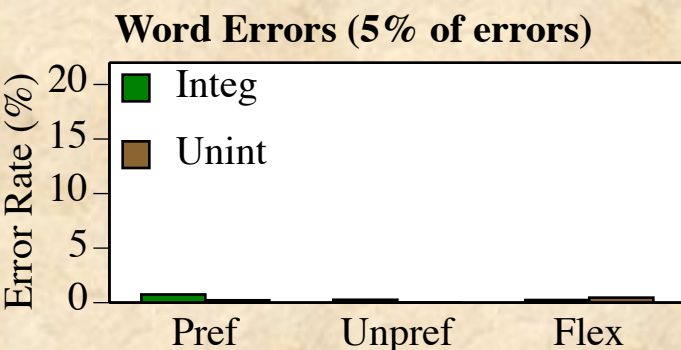
- Very small number of word errors
- Positional level analysis not possible

EXPERIMENT 2

Experiment 1 used long positive (2000 ms) SOA.
Ss viewed picture for relatively long period of time before speaking.
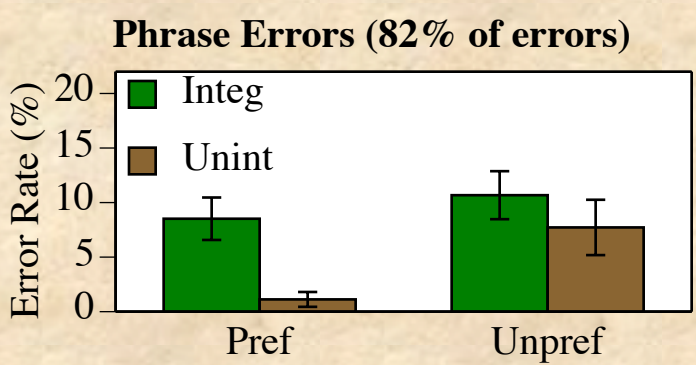Time to thoroughly plan N + Adj together may have decreased likelihood of word errors.

Method
Change to -500 ms SOA; linking word appeared before picture.
- Picture was cue to begin speaking.
- Reduced amount of time available to prepare NPs as units

62 original Ss, 10 excluded

Results

Phrase Errors (82% of errors) — Integ / Unint — Pref, Unpref

Word Errors (7% of errors) — Integ / Unint — Pref, Unpref, Flex
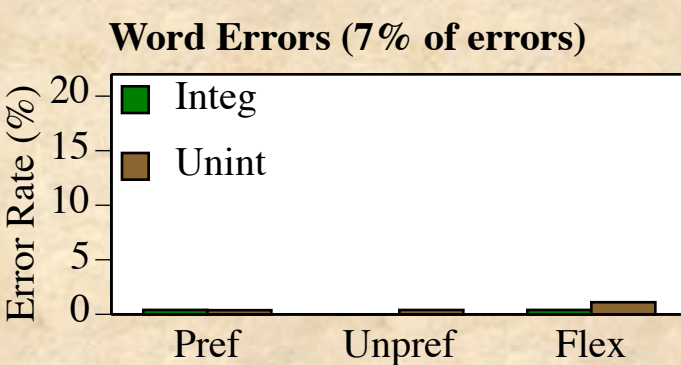
Integrated > Unintegrated
Unpreferred > Preferred (n.s. by Items)
No interaction
Replicates Pearlmutter & Solomon (2007; Exps. 5 & 7)

- Integration effect on rate of phrase exchange errors
- Functional level affected by integration.

Advance planning of full phrases did not explain lack of word errors.

- Very small number of word errors
- Positional level analysis not possible

EXPERIMENT 3

In Experiment 1, pictures remained on screen while Ss initiated responses.
Ss could refer to picture as they began to speak.
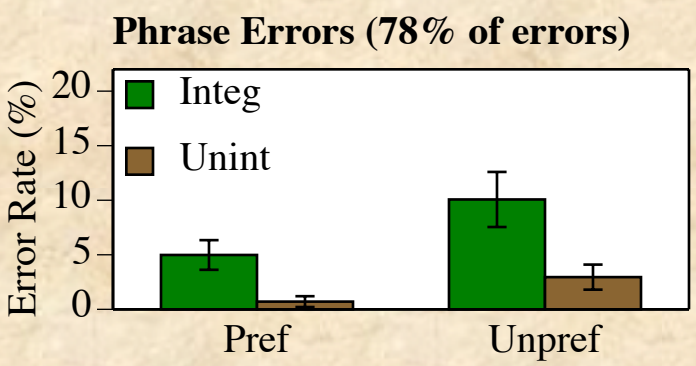Constant cue as to which Adj modified which N may have decreased likelihood of word errors.

Method
Picture disappeared upon appearance of linking word
- 2000 ms SOA
- Picture appeared before linking word; linking word was cue to speak
- Linking word remained on screen; picture disappeared
- Removed indicator of which Adj modified which N

71 original Ss, 19 excluded

Results

Phrase Errors (78% of errors) — Integ / Unint — Pref, Unpref

Word Errors (7% of errors) — Integ / Unint — Pref, Unpref, Flex

Integrated > Unintegrated
Unpreferred > Preferred (marg. by Items)
No interaction

- Integration effect on rate of phrase exchange errors
- Functional level affected by integration.

Viewing picture during initiation of response did not explain lack of word errors.
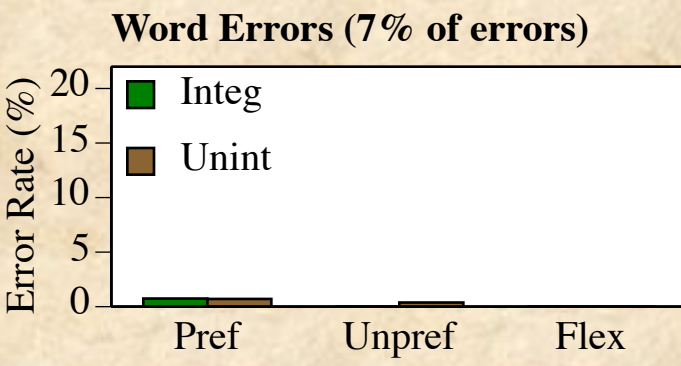
DISCUSSION

Phrase exchanges showed integration effects: Errors increased with greater integration.

Integration—a conceptual variable—appears to penetrate sentence production processes at least as far as the functional level.

Integration effects were present with greater and lesser opportunity to plan N + Adj together.

Positional level effects are unclear:
- Current paradigm did not generate enough word errors for analysis
- Two potential reasons for lack of word errors ruled out
- Future experiments will explore alternative paradigm changes

REFERENCES

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Pearlmutter, N. J., & Solomon, E. S. (2007, March). *Semantic integration and competition versus incrementality in planning complex noun phrases*. Talk presented at the 20th annual CUNY Conference, La Jolla, CA.

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