

Structural Similarity and Semantic Integration Effects on Exchange Error Production

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INTRODUCTION

Which semantic and syntactic properties increase ordering error likelihood?

Phrase and word exchanges occur during grammatical encoding (Bock & Levelt, 1994).

- Phrase exchange: Functional level—Two full phrases assigned to each other’s intended syntactic role
*I got into **this guy** with **a discussion**.*
(Intended: I got into a discussion with this guy.) (Garrett, 1980)
- Word exchange: Functional level—Two lemmas assigned to each other’s intended syntactic role, OR
Positional level—Two lexemes assigned to each other’s intended serial position
*I left the **briefcase** in my **cigar**.*
(Intended: I left the cigar in my briefcase.) (Garrett, 1980)

- Grammatical encoding stage follows message-level encoding stage.
- Influenced by both semantic (message/conceptual) and syntactic properties

Semantic/Conceptual Properties

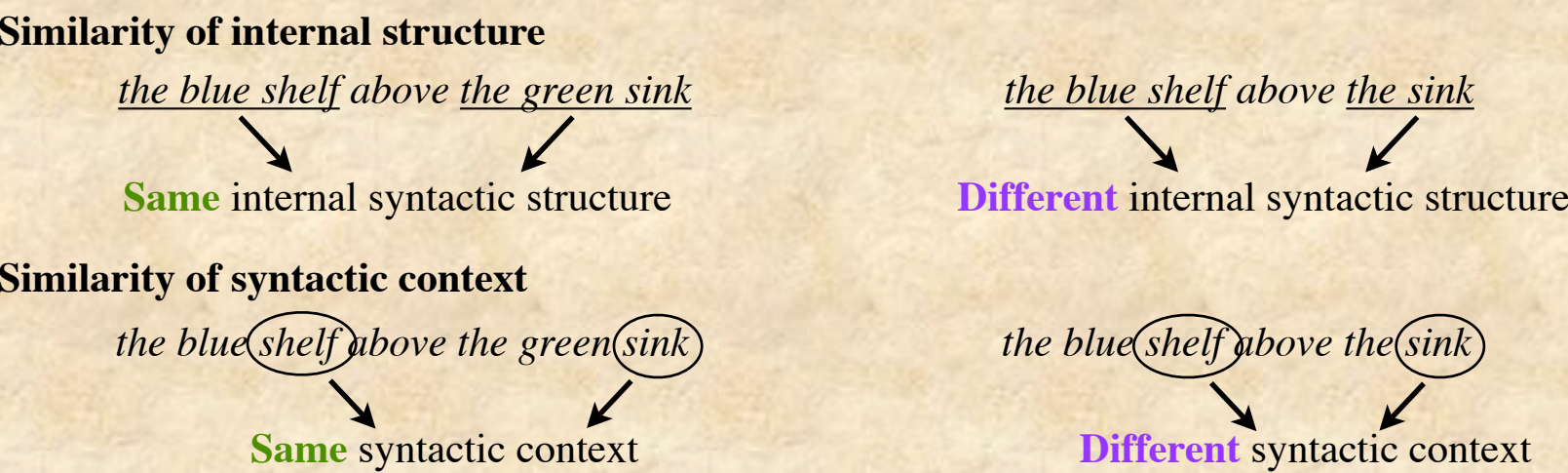
- Semantic integration (Solomon & Pearlmutter, 2004)**
Degree of message-level relatedness between utterance elements to be planned
Reflects how closely linked parts of messages are
Affects phrase exchange (functional level) error rates (DiBattista & Pearlmutter, 2010):
Errors more likely for integrated than for unintegrated stimuli

Syntactic Properties

- Correspondence of grammatical function and grammatical category (Garrett, 1980)**
Exchanging phrases and words tend to have the same (or similar) grammatical roles.
E.g., two NP heads exchange; two PP objects exchange
Word errors tend to occur between utterance components with the same grammatical category.
E.g., nouns exchange with nouns; adjectives exchange with adjectives

- Another type of grammatical similarity: Structural Similarity**
- Not previously explored in corpus analyses
 - Should influence grammatical encoding processes, as other types of grammatical similarity do

Internal structural similarity or similarity of syntactic context:



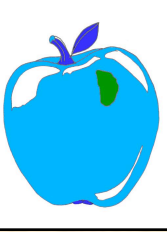
Extension of Garrett (1980): Errors will be more likely for structurally similar utterances, extending corpus work showing greater error likelihood when grammatical function and category correspond.

- Compared to utterance components lacking structural similarity
- NPs with same internal structure more likely to exchange.
 - Words in same syntactic contexts more likely to exchange.

METHOD

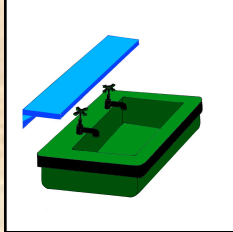
32 pictures featuring a common object and attribute, or two common objects
Pictures varied in integration, preference, and color scheme.
Integration and preference normed previously.

16 **integrated** pictures



Preferred
the green spot on the blue apple
Unpreferred
the blue apple with the green spot

16 **unintegrated** pictures



Preferred
the blue shelf above the green sink
Unpreferred
the green sink below the blue shelf

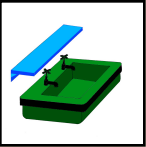
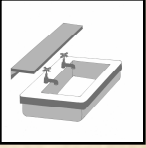
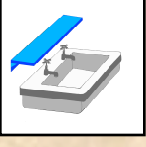
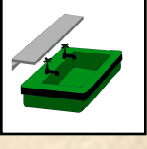
- Color application to both picture components, neither component, or exactly one component
Color application on pictures determined presence of/placement of utterances adjectives.
Four color schemes, collapsed into two structural similarity conditions
- Both Components Colored

Neither Component Colored
- First Component Colored

Second Component Colored
- Same Structure

Different Structure

METHOD (CONT'D)

Structure	Picture	Color Scheme	Correct Description (Preferred)
Same		Both Components	the blue shelf above the green sink
		Neither Component	the shelf above the sink
Different		First Component	the blue shelf above the sink
		Second Component	the shelf above the green sink

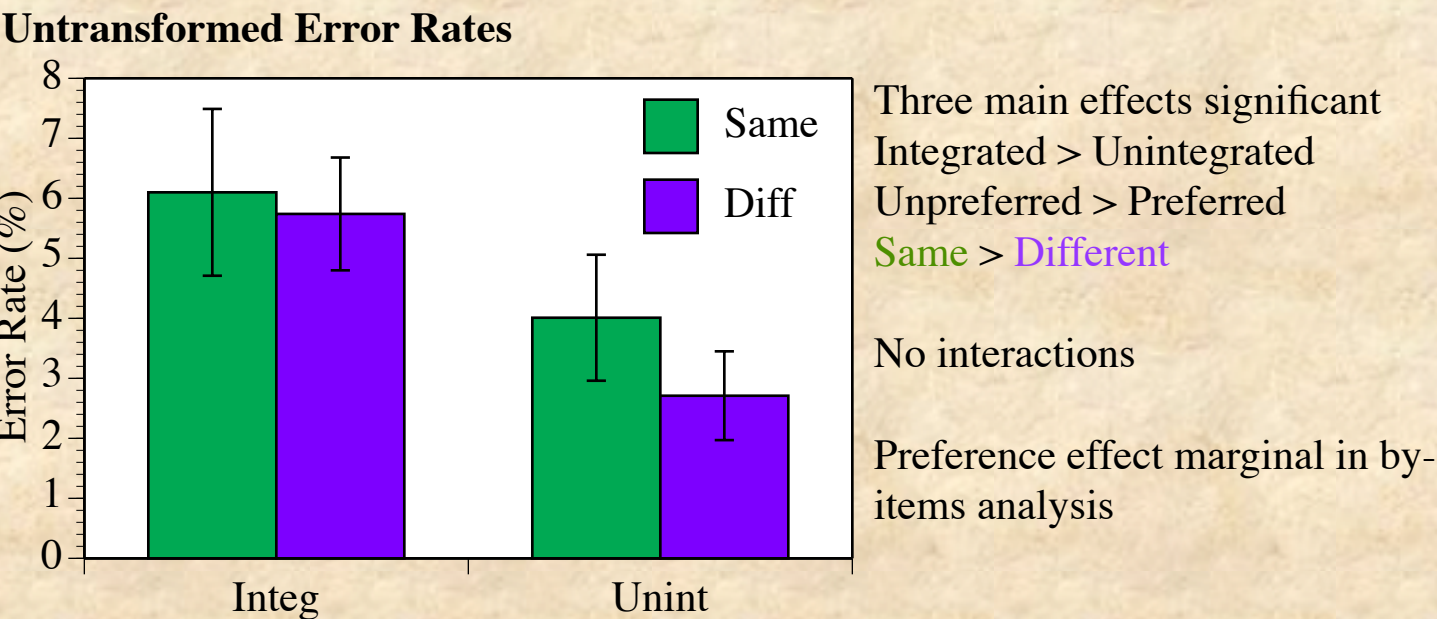
Two familiarization phases
“Neither Colored” version of each picture presented with noun labels below it.
Ss instructed to focus on and learn labeled parts of pictures.

Test phase
Picture in one of four color schemes appeared.
Preposition appeared below (2000 ms SOA).
Ss described pictures using noun labels, color words if appropriate, and preposition.

129 original participants; 18 excluded for too many unusable trials/no responses in certain conditions
Coded as corrects vs. ordering errors (*the sink above the shelf*; intended: *the shelf above the sink*)
Errors coded for grammatical category and movement type (phrase vs. noun; exchange vs. anticipation).

RESULTS

Error responses to “Neither Colored” pictures excluded: Ambiguous error category assignment
Weighted linear regressions on empirical-logit transformed error proportions
Fixed effects: Integration, Structural Similarity, Preference, and their interactions
Either participants or items as random effect



Separate analyses on phrase errors alone and word errors alone:
Same numerical patterns of effects and similar significance patterns
Phrase (49% of errors): Three main effects significant; no interactions (by both subject and items)
Word (9% of errors): Integration and Similarity main effects significant, no interactions by subjects
Same pattern by items, except for marginal integration effect

DISCUSSION

- Structural similarity affects exchange error rates.
- Presence of structural similarity increases likelihood of errors.
 - Phrase errors sensitive to internal structural similarity
 - Word errors sensitive to syntactic contextual similarity
 - Experimental support for type of grammatical similarity not previously investigated

Semantic integration and description preference effects replicate DiBattista & Pearlmutter’s (2010) phrase-error (functional level) results.

Nonsignificant preference effect for word errors; less power to detect it with so few word errors.

REFERENCES & ACKNOWLEDGEMENTS

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