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Noun-Phrase-Internal Structural Priming in a Picture-Description Task

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INTRODUCTION

Structural Priming between Sentences and Noun Phrases

Structural priming
Processing an utterance with a particular form increases the likelihood and ease of processing a subsequent utterance with the same form (Pickering & Branigan, 1999).

Priming of sentence structure (Bock, 1986, Experiment 1)
Participants described pictured events (e.g., a man reading to a child) with transitive or dative sentences.
Critical trial pairs: Description preceded by repetition of prime sentence by participant.

Prime Group	Prime Type	Example Prime
Transitive	Active	A clerk dropped the file into the wastebasket.
	Passive	The file was dropped by the clerk into the wastebasket.
Dative	Prepositional	The corrupt inspector offered a deal to the bar owner.
	Double-Object	The corrupt inspector offered the bar owner a deal.

Responses more likely to be produced with same structure as prime than with alternative structure.

The structure of produced sentences can be primed by the structure of previously produced sentences.

Priming of noun-phrase structure (Cleland & Pickering, 2003, Experiment 2)
One interlocutor described picture of common object (e.g., fork, tree); the other located it in an array.
Confederate interlocutor varied structure evenly between prenominal adjective and relative clause constructions.

Prime Trial Picture	Prime Type	Prime NP
	Prenominal adjective	the green fork
	Relative clause	the fork that's green

Target utterances more likely to be produced with confederate's prime's structure than with alternate structure.

Noun-phrase structure can be primed.

Priming and ease of processing (Wheeldon & Smith, 2003, Experiment 1)
Participants described pictures of two common objects moving in relation to one another.

Target Response	Prime Type	Prime
The spoon and the car move up.	Related	The fish and the eye move down.
	Unrelated	The fish moves down and the eye moves down.

Latencies to targets following related primes faster than following unrelated primes.

Structural priming increases ease of production.

The "inverse-preference" effect (Hartsuiker, Kolk, & Huiskamp, 1999; Ferreira & Bock, 2006, for review)
Picture-description (events and situations) / priming task with locative primes in Dutch

Prime Type	Prime (English Translations)
Locative State	A book lies on the shelf.
Frontal Locative	On the shelf lies a book.

Frontal locative structure less commonly used (less preferred) than locative state structure in baseline data collection.
Priming from frontal locative primes greater than from locative state primes.

Greater priming for less preferred structures.

Can structural priming occur within complex NPs?

Complex NP comprising two smaller NPs and a preposition

NP1 Det–Adj–N Prep NP2 Det–Adj–N
the green sink above the blue shelf
Identical structure

NP1 Det–Adj–N Prep NP2 Det–N–RC
the green sink above the shelf that's blue
Different structures

Predictions
Priming in two directions: From NP1 to NP2, and from NP2 to NP1

Responses containing two same-structure NPs will be less error-prone (easier).

Smaller NPs planned with some degree of temporal overlap (Bock & Levelt, 1994).
Overlapping components' structures available to prime each other.
Opportunity for forward (NP1 to NP2) and backward (NP2 to NP1) priming.

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METHOD

Method

16 object–attribute pictures (e.g., an apple with a spot); 16 two-object pictures (e.g., a shelf above a sink)
Solid color or checkered color from two-color schemes applied to both or exactly one picture component.
Type of color determined placement of adjective in responses; assignment counterbalanced between Ss.

Color Scheme	Picture	Example Correct Description	Structural Homogeneity	Response Structure
Two Solid		the green shelf above the blue sink	Homogeneous	PA–PA
Two Checkered		the shelf that's green above the sink that's blue	Homogeneous	RC–RC
One Solid, One Checkered		the green shelf above the sink that's blue	Heterogeneous	PA–RC
		the shelf that's green above the blue sink	Heterogeneous	RC–PA

Two familiarization phases: Ss introduced to stimuli and component labels.

Test phase
Picture in one of four color schemes
Preposition linking word appeared below (+2000 ms SOA).
Ss described pictures using component labels, color words in structure per instructions, and preposition.

83 of 171 Ss' data analyzed; missing Ss excluded due to unusable trials, most likely due to difficulty of task.
Responses coded as correct responses, structure errors, and movement errors (excluded).
Structure errors: At least one NP produced with structure opposite of what was instructed.

Response Type	Response	Count
Correct Description	the green shelf above the blue sink	2367
NP1 Structure Error	the shelf that's green above the blue sink	22
NP2 Structure Error	the green shelf above the sink that's blue	167
Full NP Structure Error	the shelf that's green above the sink that's blue	38

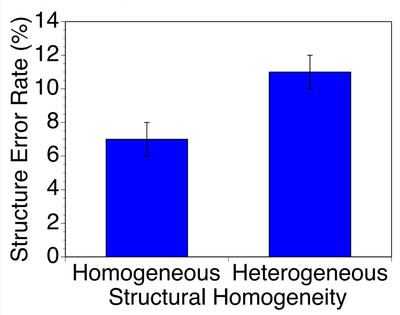
Error rates for homogeneous vs. heterogeneous expected responses analyzed.

Error responses further analyzed for forward and backward priming.

Forward priming For each correct NP1 structure, rate of identically vs. differently structured NP2s compared.
Backward priming For each correct NP2 structure, rate of identically vs. differently structured NP1s compared.

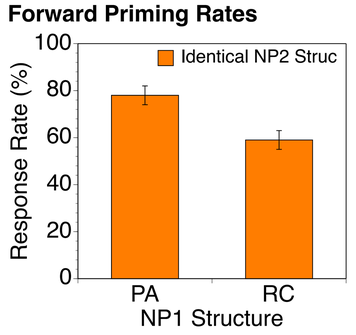
Results

Structure Error Rates



Structure errors less likely for homogeneous responses.

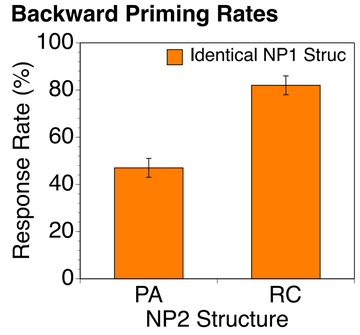
Forward Priming Rates



Identical NP2 structure more likely than different NP2 structure.

Difference in likelihood greater for NP1 = PA.

Backward Priming Rates



Identical NP1 structure more likely than different NP1 structure, given RC in NP2.

CONCLUSIONS

Structural priming occurs within complex NPs.
- Priming may facilitate production in this task, with its very limited repertoire of structures.

Homogeneous NPs were less error-prone.
- Structural reuse may have increased ease of production.

Within-NP priming can occur forward (NP1's structure primes NP2's) or backward (NP2's structure primes NP1's).
- NP2 must be activated at some degree of temporal overlap with NP1.
- Consistent with speech error evidence that constituents can overlap in timing of activation
- Inconsistent with strictly incremental models of production, which suggest vertical but not horizontal parallel processing

Backward priming was restricted to NP2s with an RC structure.
- RC structure may be more difficult to build or unpreferred (in this experiment or in general).
- Processing may be different for difficult/unpreferred vs. easier/preferred structures in NP2 position.