(de-)composition
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Big issue

Something has to be stored in the long term memory.

-> Minimally, idiosyncratic information of atomic units must be stored (“lexicon”).

We can always create novel expressions.

-> Long-term memory is not sufficient

-> Some sort of combinatorial mechanism has to be involved.

The relative contributions of memory and combinatorial mechanisms in language processing

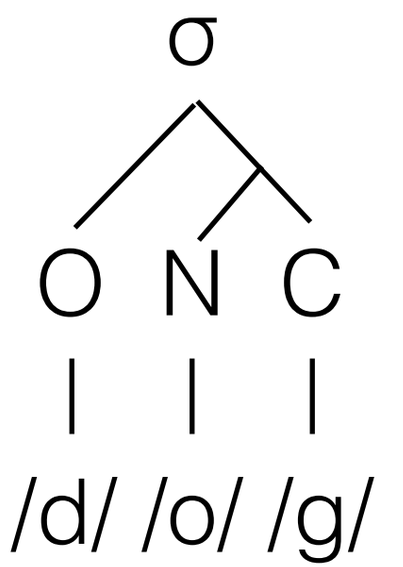
Today's focus

The relative contributions of memory and combinatorial mechanisms in language processing

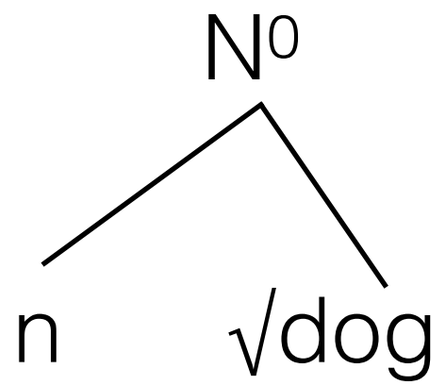
How can we use psycholinguists toolkit to address this question?

Complex units in language

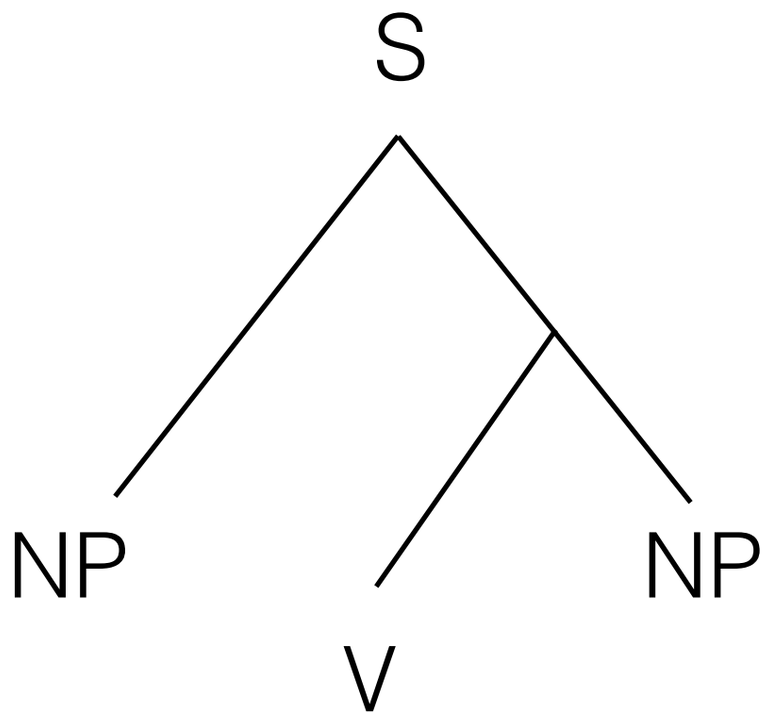
Phonology



Morphology



Syntax



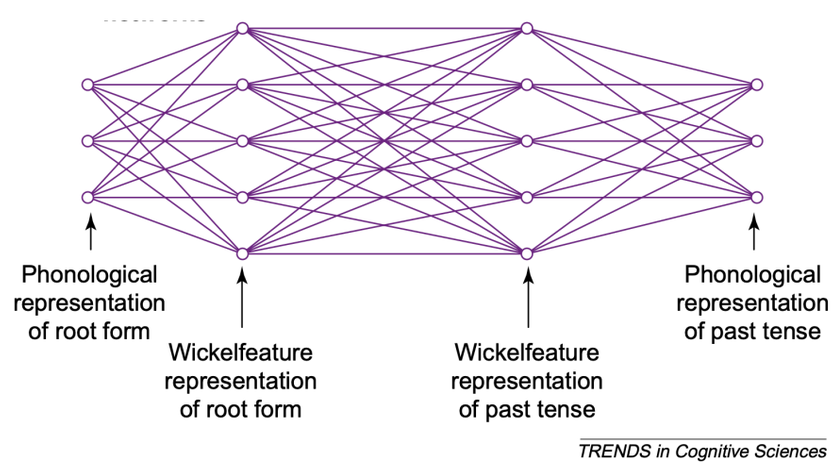
The dog chases the cat.

What gets retrieved from LTM, and what gets constructed on the fly?

Decompose or not?

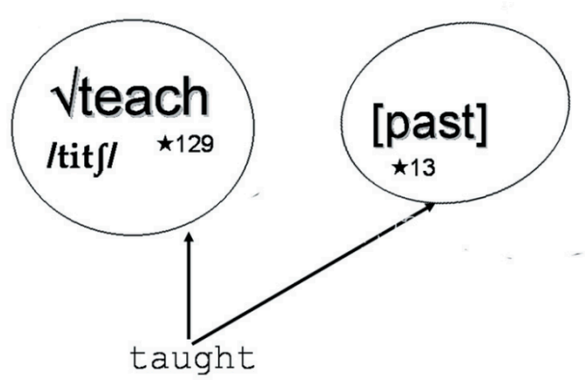
Associative network

The relationship between root and inflected form is associative. No decomposition takes place.



Full-decomposition

The relationship between root and inflected form is compositional. Decomposition (always) takes place.



Decompose or not?

Associative network

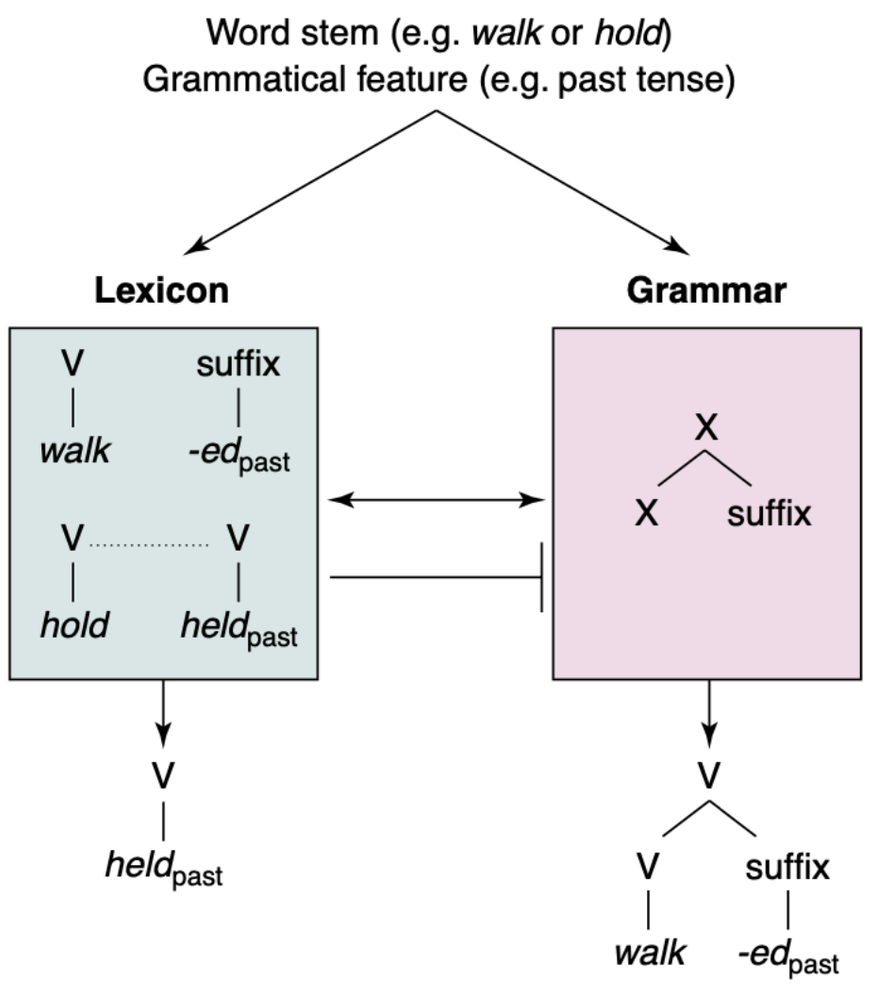
The relationship between root and inflected form is associative. No decomposition takes place.

There is no special status ascribed to the relationship between roots and their inflected forms

Although the model is often described in terms of generating a past tense form from a stem input, McClelland and colleagues are clear to point out that this is not generativity in the Chomskian sense (Chomsky, 1968). The past tense output is 'generated' if its probability of being the past tense correlate of a particular stem is sufficiently high. This generalization only happens when the system encounters a novel stem form. Once a stem/allomorph pair has been learned by the system, the notion of generation is no longer relevant. The connections between the two forms, mediated by their phonological and semantic associations, have stable, quantifiable strengths, just as other connections in the system do. Recognizing or producing a familiar past tense form involves no decomposition or composition mechanisms — processing *taught* certainly involves activation of *teach* by virtue of the shared semantics of the two forms, but processing *taught* also involves activation of other semantic relatives, such as *instruct*, *student*, and *textbook*.

Decompose or not?

Word and rules (hybrid)



Regular: Decomposition

Irregular: No decomposition

Discussion

How can we use psycholinguists toolkit to evaluate the decompositional vs. non-decompositional views?

Decomposition?: Argument from root frequency

Lexical decision
frequency of the whole matched.

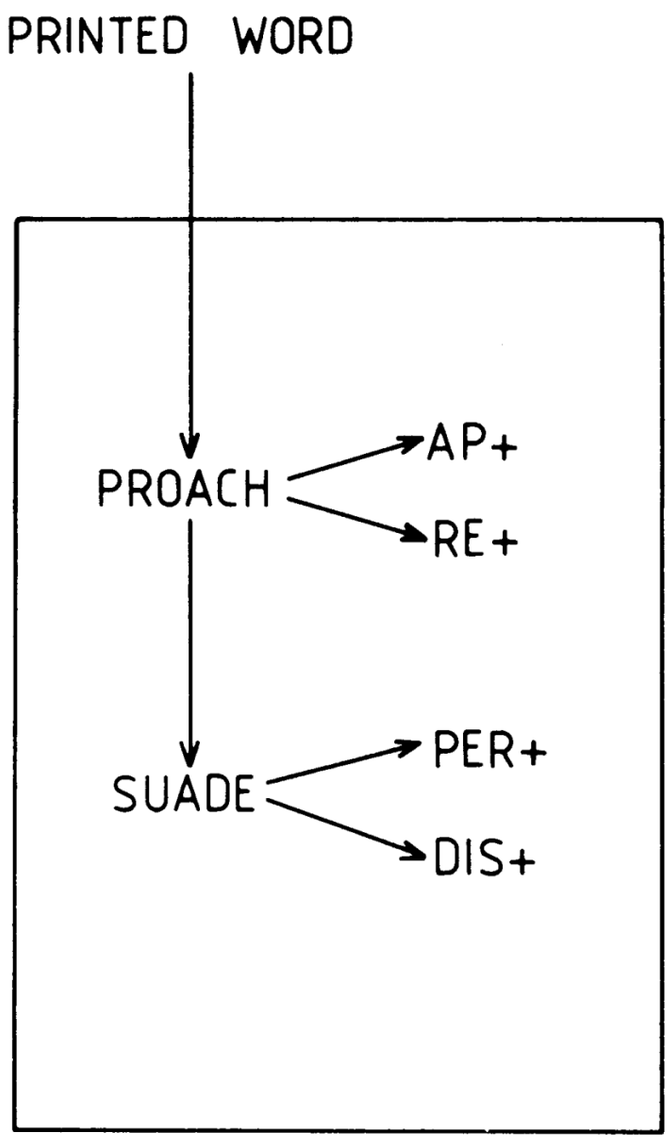


Figure 1. Model of the lexicon where words coming from the same stem are accessed through the same entry.

Table 1
Mean Reaction Times (in Milliseconds), Standard Errors, and Percentage Error Rates for the HFS and LFS Conditions

Condition	Example	Reaction Time	Standard Error	Percent Error
HFS	Reproach	747	12	6
LFS	Dissuade	794	15	4

Table 2
Mean Reaction Times (in Milliseconds), Standard Errors, and Percentage Error Rates for the Four Conditions

Frequency Condition	Example	Reaction Time	Standard Error	Percent Error
		Inflected		
High	Sized	558	7	1
Low	Raked	607	8	8
		Uninflected		
High	Parent	560	8	5
Low	Tennis	593	29	8

Tufts (1979)

Obligatory decomposition?: argument from priming

Arabic etymon: (Unordered) sets of two consonants (or even phonological features).

[**m**aa**t**a] and [**t**a**m**ma]

Cross-modal lexical decision task

Table 2
Cross-modal mean lexical decision times (RT), standard deviations (SD) and percentage error rates (%Error)

	Prime	Target	RT (ms)	SD	%Error
1a: [+Etym, +Sem]	مبتل [mu**b**ta**l**lun] "wet"	وابل [waa**b**i**l**un] "downpour"	605	60	5
2a: [-Etym +Phon]	بليد [**b**a**l**iidun] "stupid"	وابل [waa**b**i**l**un] "downpour"	678	81	3
3a: [Unrelated]	شهادة [ʃahaadatun] "testimony"	وابل [waa**b**i**l**un] "downpour"	666	90	4
1b: [+Etym -Sem]	اقتفاء [ʔiqtifaaʔun] "tracking"	توفيق [tawfiiqun] "success"	601	57	6
2b: [-Etym +Phon]:	فاتورة [faatuuratun] "bill"	توفيق [tawfiiqun] "success"	676	87	5
3b: [Unrelated]	غزارة [ɣazaaratun] "abundance"	توفيق [tawfiiqun] "success"	665	73	7

Boudelaa et al. (2005)

Obligatory decomposition?: argument from priming

Table 2. Mean M350 Latencies and Lexical Decision Times (all in ms) Averaged Across Items in Experiment 1.

Condition	MEG			RT		
	Rel.*(SD)*	Unrel.*(SD)*	Dif.	Rel.*(SD)*	Unrel.*(SD)*	Dif.
Identity	323.2*(31.3)*	354.9*(26.2)*	–31.7*	603.4*(138)*	665.9*(171.1)*	–62.5**
Hi-O Irr (eg. *gave–give*)	347.6*(25.6)*	374.1*(48.2)*	–26.5*	586.9*(124.3)*	605.6*(142)*	–18.7*
Lo-O Irr (eg. *taught–teach*)	338.7*(57.4)*	371.1*(41.8)*	–32.4*	619.5*(184.4)*	606.5*(151.9)*	13
Ortho-O (eg. *stiff–staff*)	343.1*(28.9)*	359.2*(26.9)*	–16.1	664.7*(192.6)*	637.1*(162.5)*	27.6*

Table 5. Mean Lexical Decision Time (ms) Averaged Across Items in Experiment 2

Condition	Overall	Rel.*(SD)*	Unrel.*(SD)*	Diff.
Regular (eg. *jump–jumped*)	637.85*(51.12)*	649.43*(49)*	625.33*(51.37)*	–24.1
Hi-Overlap Irr (eg. *give–gave*)	600.48*(46.15)*	587.9*(45.53)*	613.06*(44.05)*	–25.16
Lo-Overlap Irr (eg. *teach–taught*)	600.32*(44.01)*	586.5*(36.9)*	614.14*(46.8)*	–27.64
+S+O-M(eg. *boil–broil*)	666.05*(55.85)*	666.13*(50.44)*	665.96*(61.99)*	–0.17
Average	624.10*(55.75)*	613.83*(55.48)*	634.18*(54.41)*	–13.78

Obligatory decomposition?: argument from priming

The dual route model fails to account for the priming effect in the irregular conditions.

The associative model fails to account for the priming effect in the 'boil-broil' condition (b/c associative model do not give special status of morphological relations)

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Storage vs. computation across levels

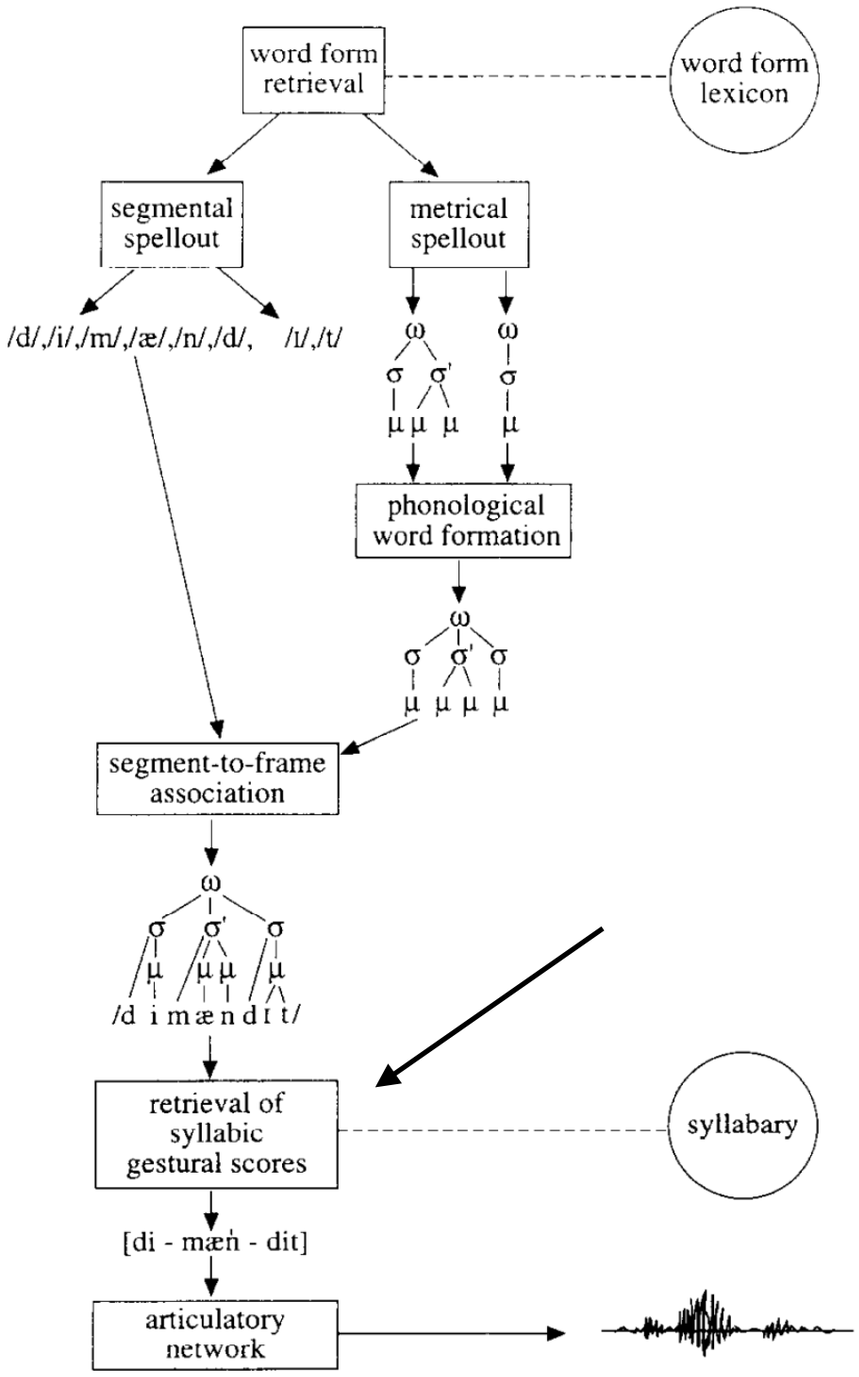


Figure 1. *A framework for phonological encoding.*

Do speakers store syllables as pre-stored unit?

Storage vs. computation across levels

Word-symbol pairs were learned by subjects, then they saw a symbol and produced a word associated with it.

\ \ \ \ \ \	nadeel	(HH)
&&&&&&	gordijn	(LH)
: : : : : :	takel	(HL)
~~	concaaf	(LL)

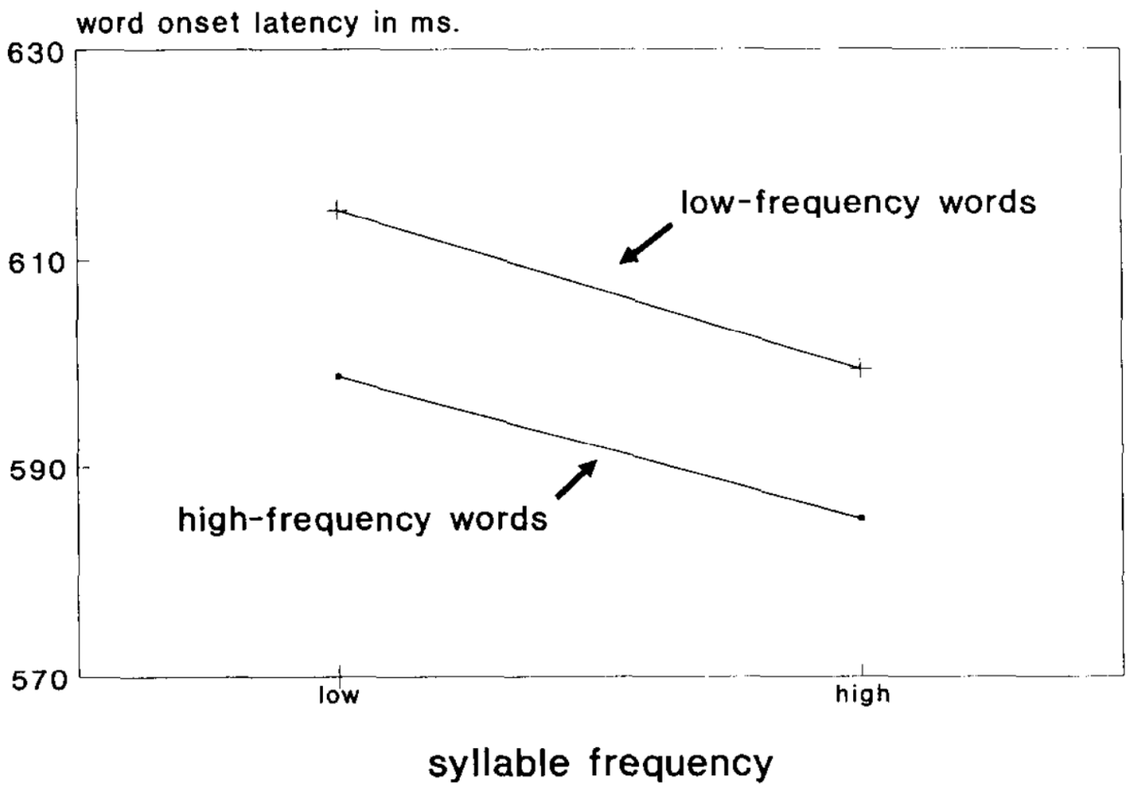


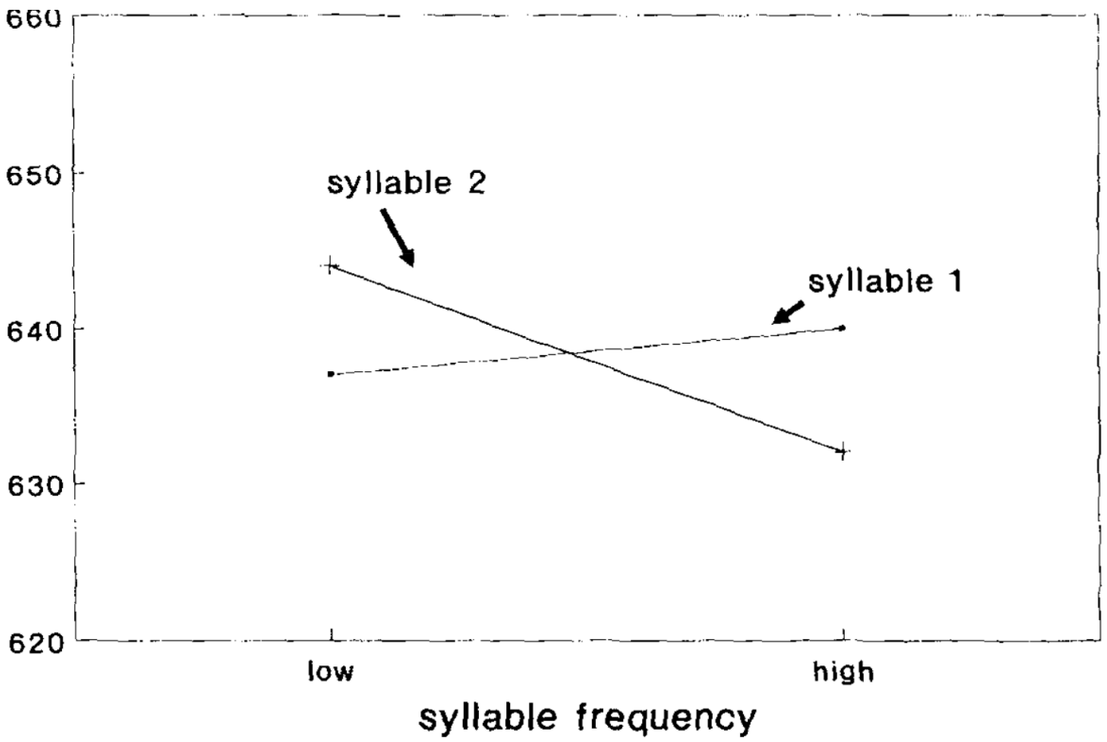
Figure 2. *Naming latencies in Experiment 1. Syllable versus word frequency.*

Additive effect of syllable frequency & word frequency

(Levelt & Wheeldon, 1994)

Storage vs. computation across levels

Independently manipulated the frequency of first vs. second syllable.



Manipulated the complexity of the second syllable

ge-mis [CVC]; *ge-schreeuw* [CCCVVC]

681ms vs. 678ms

The lack of complexity effect:
Either assembling complex syllables not more time-consuming than assembling simply syllables or syllables are pre-compiled.

(Levelt & Wheeldon, 1994)

Storage vs. computation across levels

Syntactic priming using RSVP
Ideomaticity assessed via rating

Duration	Event
200 msec	*********
100 msec	A
100 msec	proctor
100 msec	handed
100 msec	out
100 msec	the
100 msec	exams.
100 msec	###########
533 msec	4 5 2 9 1
100 msec	(screen blanked)
500 msec	two
10 msec	(screen blanked)
	No Yes
500 msec	☺
Repeat • • •	

Fig. 1. Sequence of events during every trial.

Table 5
Examples of prime and target types in Experiment 2

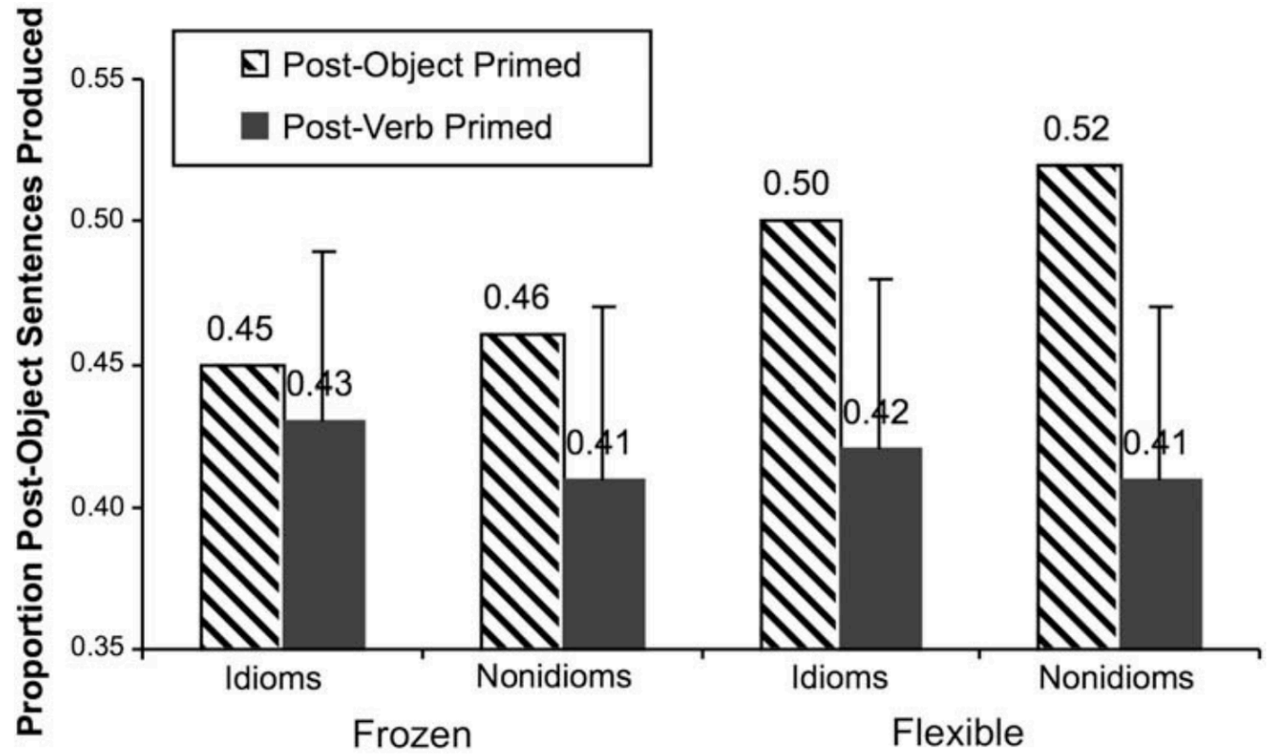
Prime types and examples
Idiomatic frozen post-verb structure
The New York Mets brought up the rear
Idiomatic frozen post-object structure
The crooked salesman couldn't take the customer in
Idiomatic flexible post-verb structure
The teenager shot off his mouth
Idiomatic flexible post-object structure
The hotel put some of the refugees up
Nonidiomatic frozen post-verb structure
The new material gave off a weird smell
Nonidiomatic frozen post-object structure
The ambassador finally asked all the reporters in
Nonidiomatic flexible post-verb structure
Judy snapped on her earrings
Nonidiomatic flexible post-object structure
The graduating senior sent his application in

Target types and examples
Nonidiomatic post-verb structure
The toddler threw away one of his toys
Nonidiomatic post-object structure
The toddler threw one of his toys away

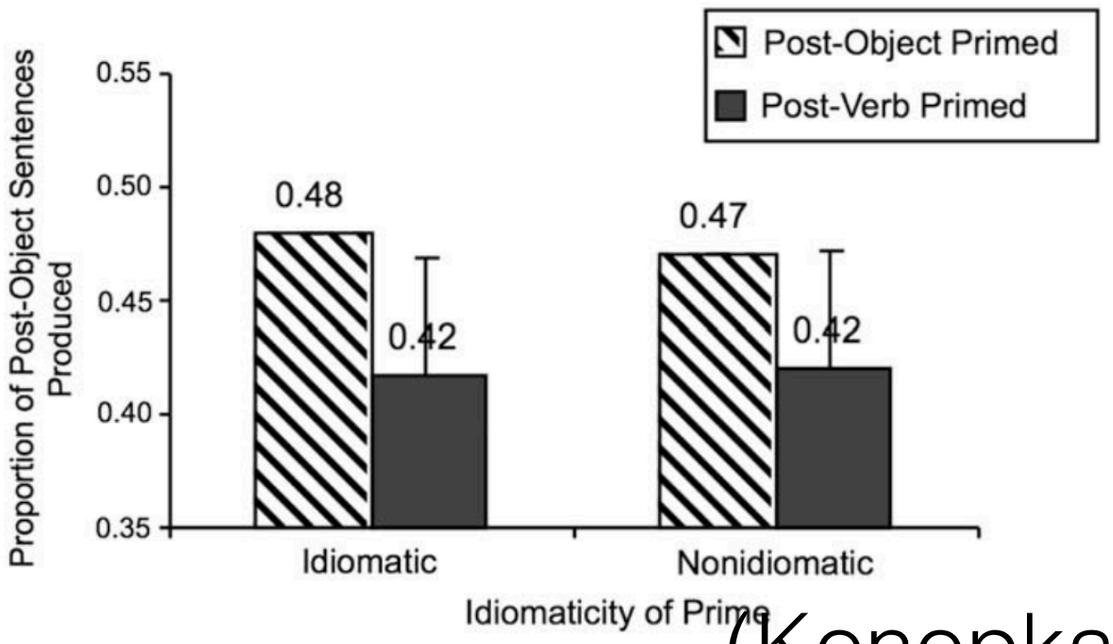
(Konopka & Bock, 2009)

Storage vs. computation across levels

Exp 2



Exp 3



(Konopka & Bock, 2009)

Storage vs. computation across levels

Prompt word(s)	Idiomatic phrase
Laura…	viel buiten de boot (3.8) *fell out of the boat*, was excluded from the group
Laura…	ging met de boot *went with the boat*, took the boat

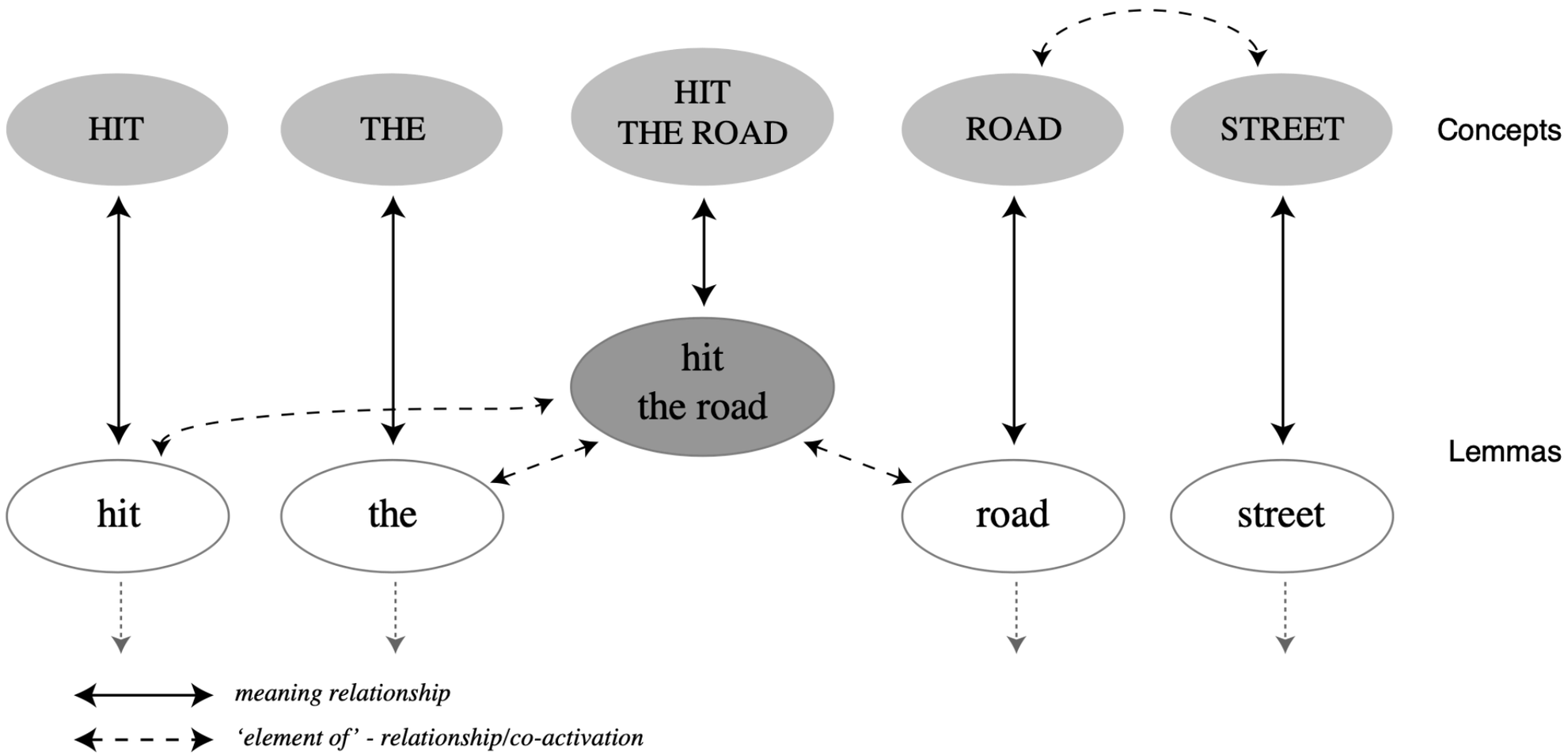
Table 1
Mean production latencies and standard deviations in Experiment 1

Idiomaticity	Prime type	
	Unrelated	Identity
Literal	890 (155)	833 (156)
Idiomatic	922 (167)	807 (145)

(Sprenger et al., 2006)

Storage vs. computation across levels

Hybrid model of idiom production



Activating “Hit” helps activate the rest of the parts (“the”, “road”) because the ‘superlemma’ serves as a path.

Today's focus

The relative contributions of memory and combinatorial mechanisms in language processing

How can we use psycholinguists toolkit to address this question?

- Constituent (root, syllable) frequency effect
- Morphological priming effect
- Syntactic priming effect