05 - Morphological representation and processing

Nick Riches

Newcastle University

October 28, 2019

Introduction

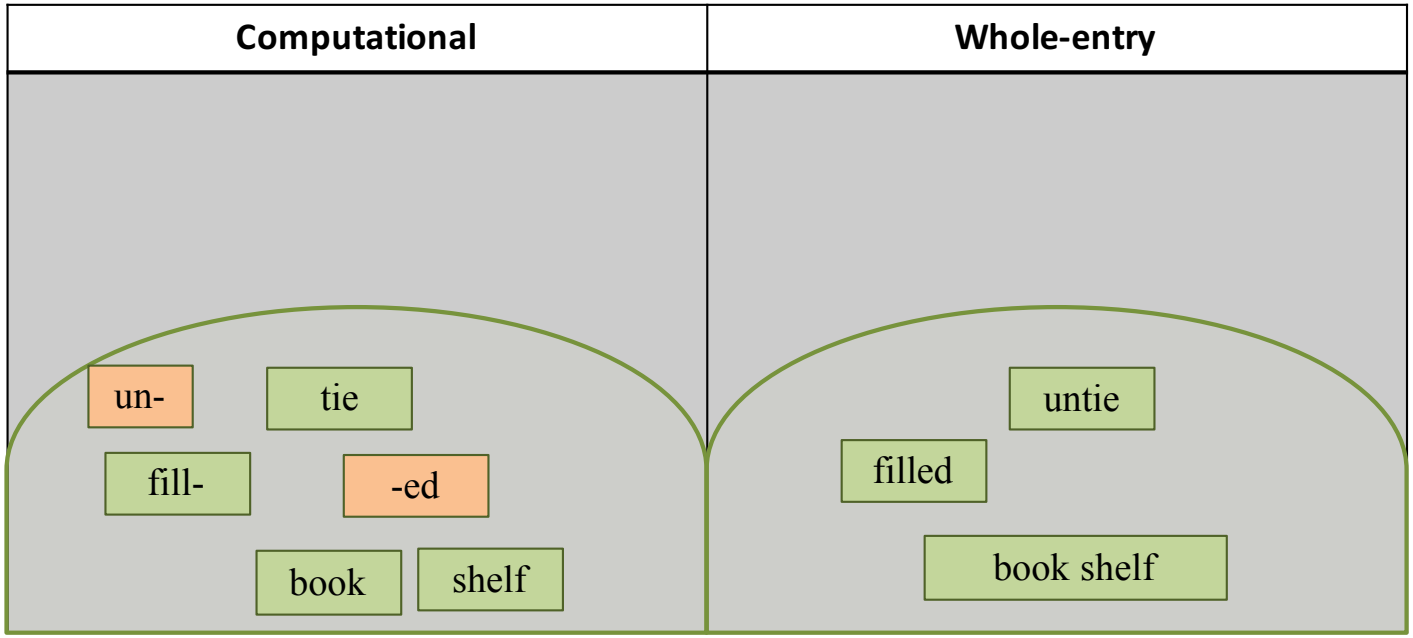
Look at these examples. What does the suffix ‘mouth’ mean? How do you pronounce it in each word?

1. Portsmouth
2. Plymouth
3. Tynemouth
4. Grangemouth
5. Cockermouth

Computational system versus lexical storage

1. A **computational** system
   Words are generated by taking a root and adding an affix (combinatoric symbolic rule)
   e.g. meaning of *laughed* is composed of two parts: LAUGH + PAST TENSE
2. A **lexical** system
   Morphologically complex words are stored / processed as wholes in the **lexicon**

Computational system versus lexical storage



1. Productive usage

1. He merengu-**ed** his way onto the dance floor
2. She was so angry that she crutch-**ed** her boyfriend
3. There are two wug-**s**
4. Look! The dog is meek-**ing**
5. The dog was **un**-meek-**able**

1. Productive usage

Berko-Gleason's 'Wug test'

wug_test.jpg

2. Morphological movement, stranding and substitution errors

1. She wash upp-**ed** the dishes.
2. I'd forgot about-**en** that
3. We have a lot of church-**es** in our minister
4. She always pack-**s** a keep
5. He gave me some good **de**-vice

3. Morpho-phonological parsing (Post et al. 2008)

Speeded same / different judgement with male and female voices

Type	Example	RT
Real infl.	Fill**ed**-fill	
Pseudo infl.	Mil**d**-mile	
Novel infl.	Nill**ed**-nill	
No infl.	Bel**t**-bell	

3. Morpho-phonological parsing (Post et al. 2008)

Speeded same / different judgement with male and female voices

Type	Example	RT
Real infl.	Fill**ed**-fill	949
Pseudo infl.	Mil**d**-mile	
Novel infl.	Nill**ed**-nill	
No infl.	Bel**t**-bell	

3. Morpho-phonological parsing (Post et al. 2008)

Speeded same / different judgement with male and female voices

Type	Example	RT
Real infl.	Fill**ed**-fill	949
Pseudo infl.	Mil**d**-mile	932
Novel infl.	Nill**ed**-nill	
No infl.	Bel**t**-bell	

3. Morpho-phonological parsing (Post et al. 2008)

Speeded same / different judgement with male and female voices

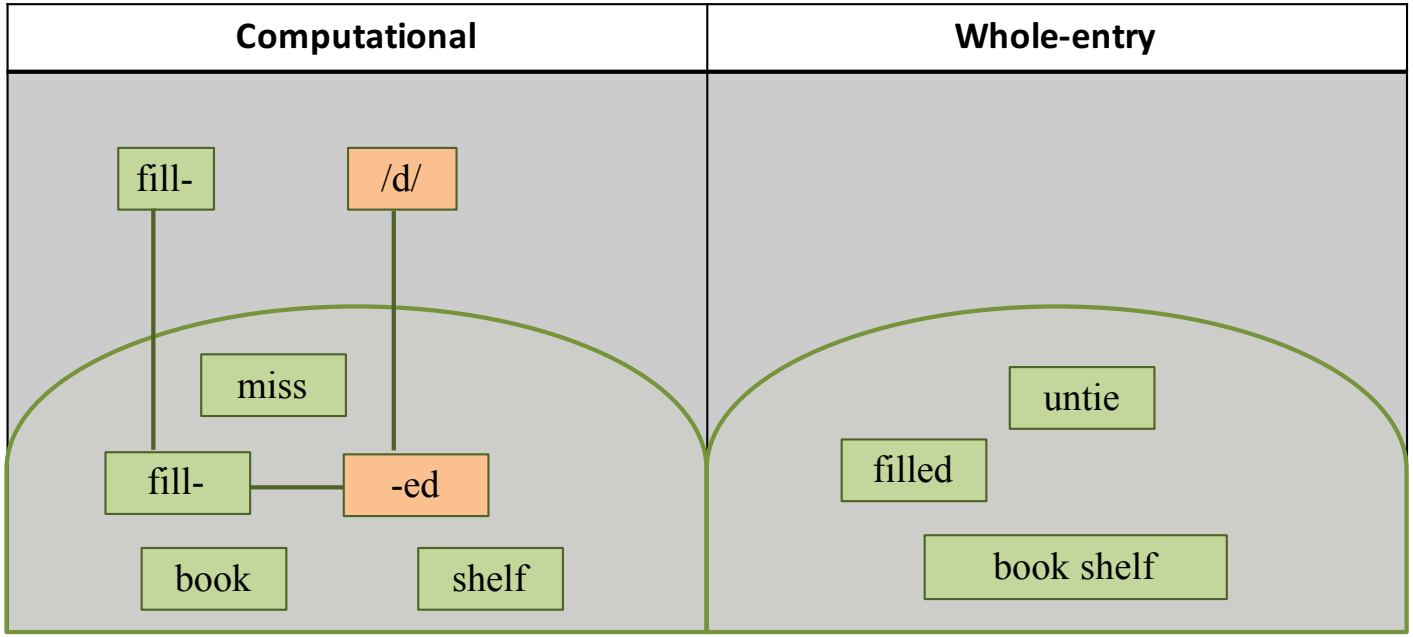
Type	Example	RT
Real infl.	Fill**ed**-fill	949
Pseudo infl.	Mil**d**-mile	932
Novel infl.	Nill**ed**-nill	908
No infl.	Bel**t**-bell	

3. Morpho-phonological parsing (Post et al. 2008)

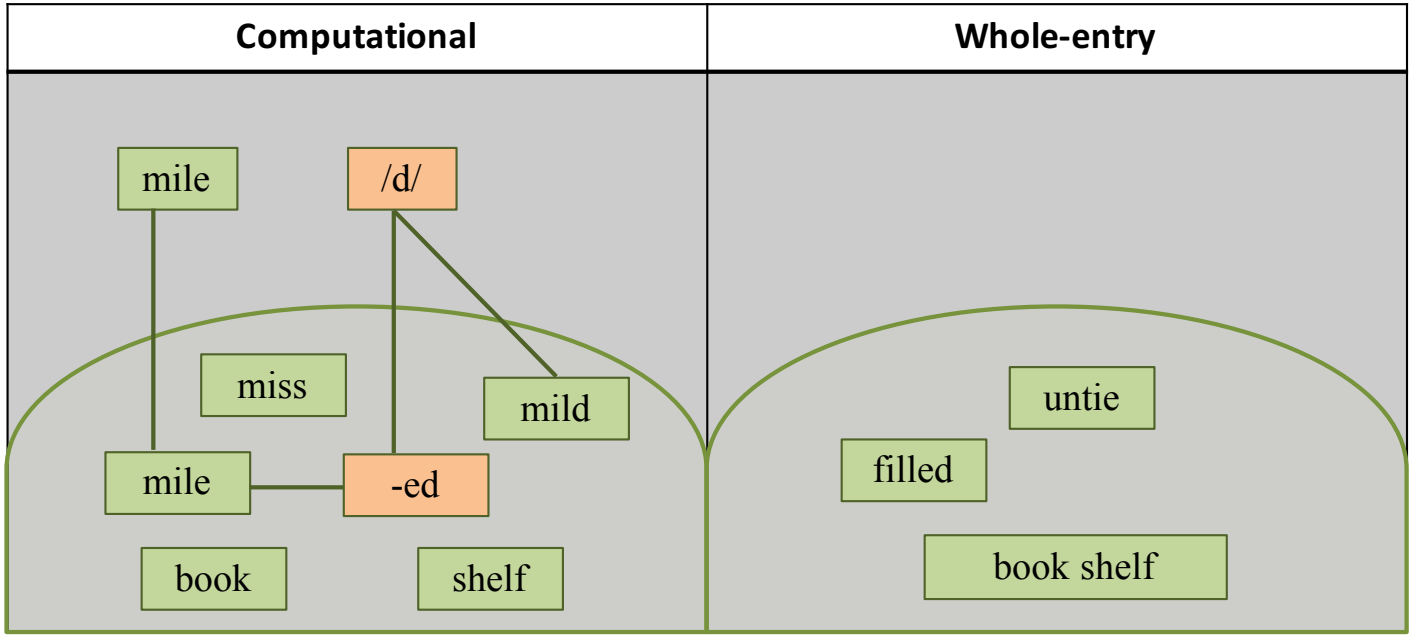
Speeded same / different judgement with male and female voices

Type	Example	RT
Real infl.	Fill**ed**-fill	949
Pseudo infl.	Mil**d**-mile	932
Novel infl.	Nill**ed**-nill	908
No infl.	Bel**t**-bell	806

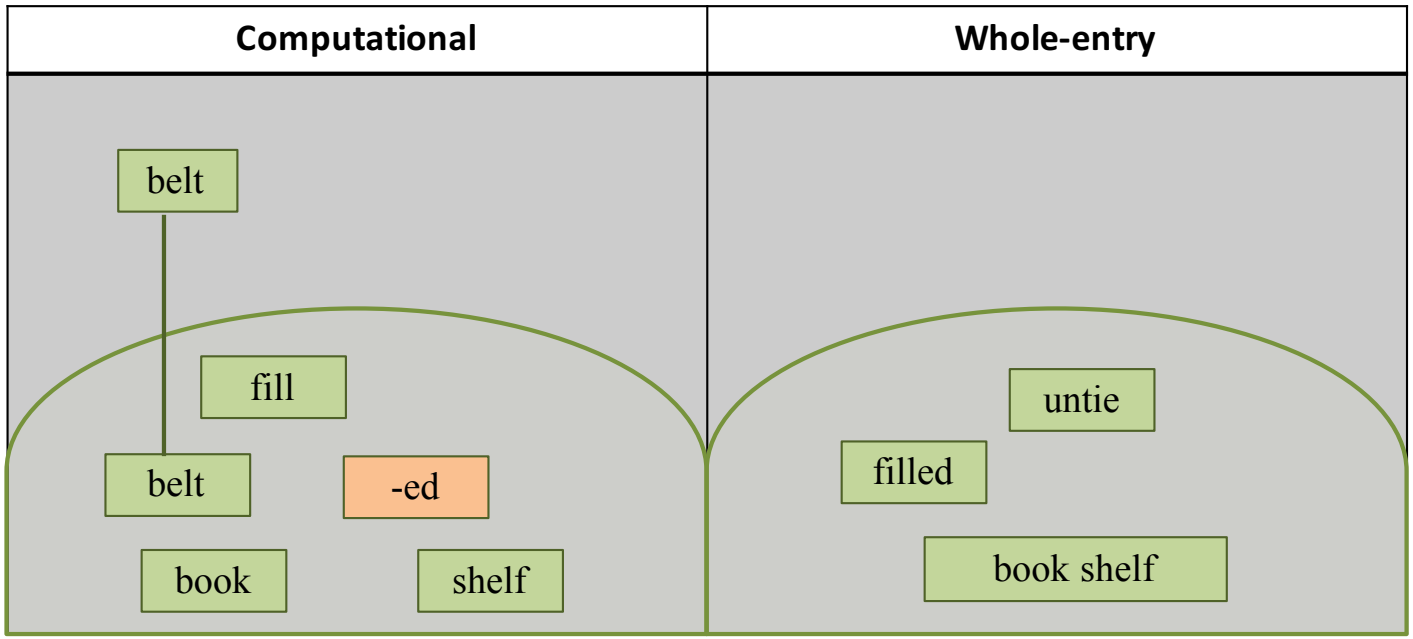
3. Morpho-phonological parsing (Post et al. 2008)



3. Morpho-phonological parsing (Post et al. 2008)



3. Morpho-phonological parsing (Post et al. 2008)



4. Phonotactic evidence

lost → frost, accost, riposte

swam → dam, tram, ham

turn**ed** → spurn-**ed**, learn-**ed**, earn-**ed**

1. Non-word roots

1. Un-re-**mitt**-ing-ly
2. It's in-**evit**-able
3. The food supplies were de-**plet**-ed

2. Multiple meanings

Agent / instrument ambiguity

Strip**per**

Garden**er**

Cook**er**

3. Psycholinguistic evidence

Losiewicz (1995)

lap**s** $\longrightarrow$ lap**se** $\rightarrow$

hov**ered** $\longrightarrow$ cov**ered** $\rightarrow$

knea**ded** $\longrightarrow$ nee**ded** $\rightarrow$

3. Psycholinguistic evidence

Losiewicz (1995)

laps**s**⟶ laps**se**→

hov**ered**⟶ cov**ered**→

knea**ded**⟶ nee**ded**→

Alegre & Gordon (1999)

Relation between speed of lexicality judgement and frequency of inflected form **only when inflected form exceeds a specific frequency threshold (1 word per 7 million)**

Strong evidence for two systems

Novel inflected forms, e.g. *meek*-**ed**

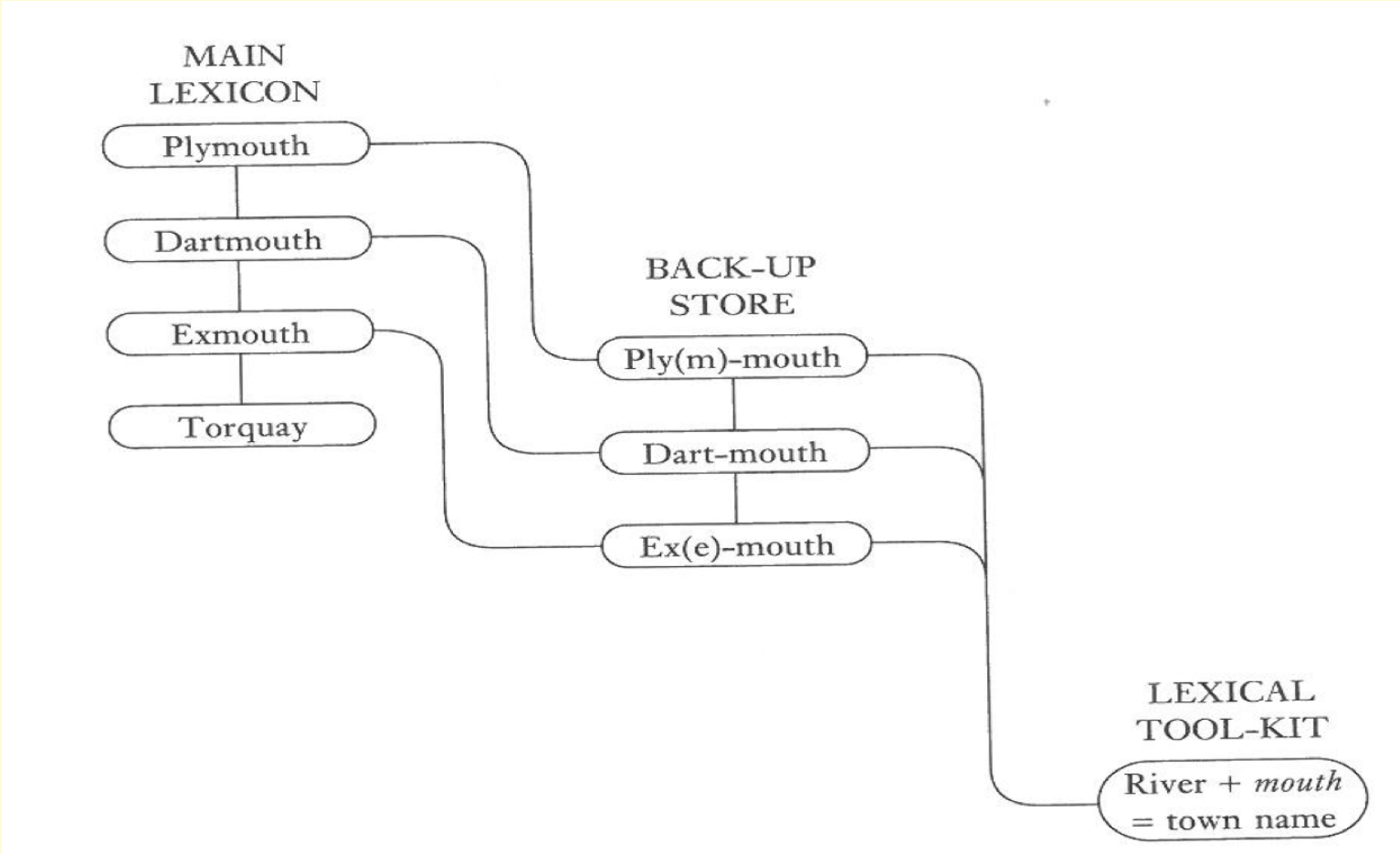
Non-word roots, e.g. *un*-**remitt**-*ing*-*ly*

Strong evidence for two systems

$$\text{processing} \Leftarrow \Rightarrow \text{expressivity}$$

Gradient phenomena

Aitchison, 'Words in the Mind' (2002)

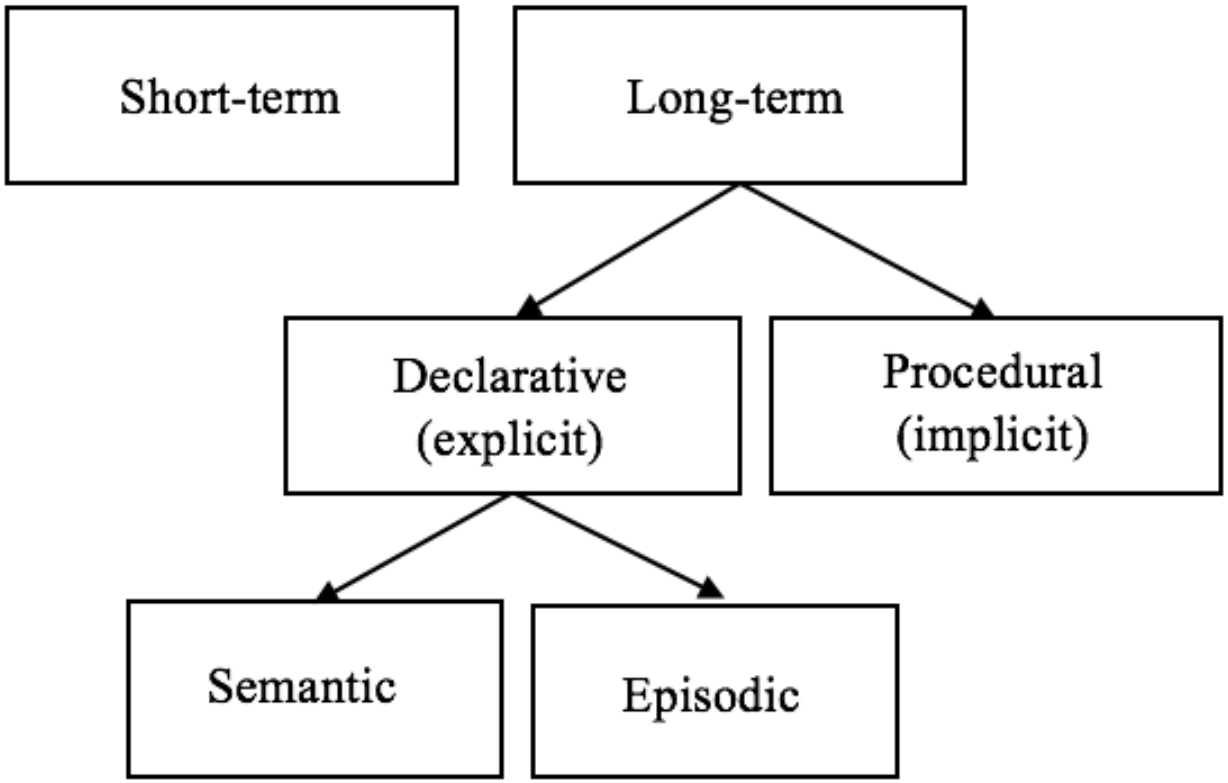


Gradient phenomena

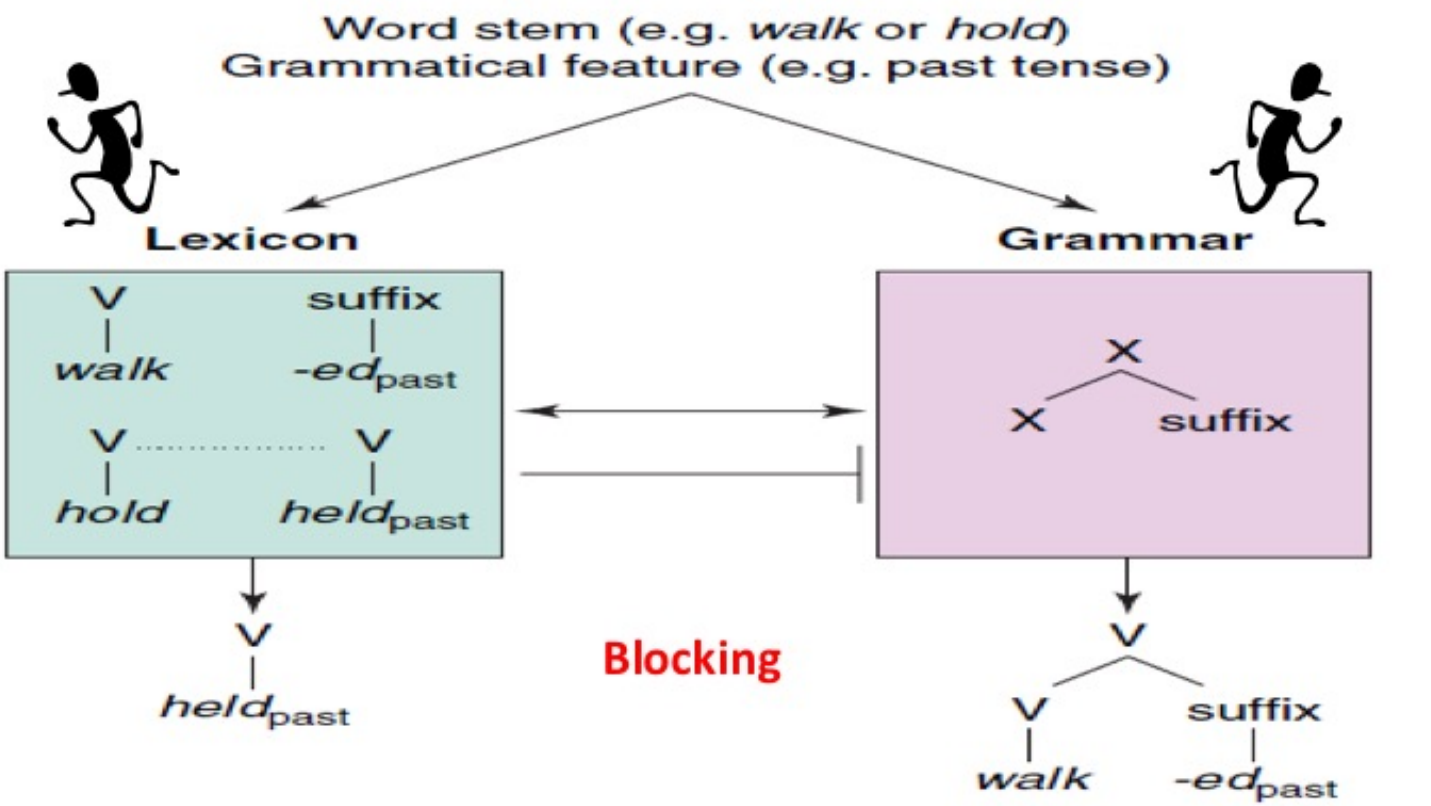
*Chicken***less** *nuggets* ⇒
*A care***less** *person* ⇒
*A gorm***less**/*ruth***less** *person*

Procedural versus Declarative memory

Tulving's Memory model



The model



Evidence

Pinker & Ullman (2002) - Frequency effects are only found in the irregular system

1. Children's overregularisation errors, e.g. *she swammed* are determined by the density of the irregular neighbourhood
   e.g. [*swim* → *swam*, *sing* → *sang*] versus
   [*bring* → *brought*, *buy* → *bought*, *seek* → *sought*, *teach* → *taught*, *fight* → *fought*]
2. Adult generation of inflected form is affected by input frequency only in the irregular system.

Evidence

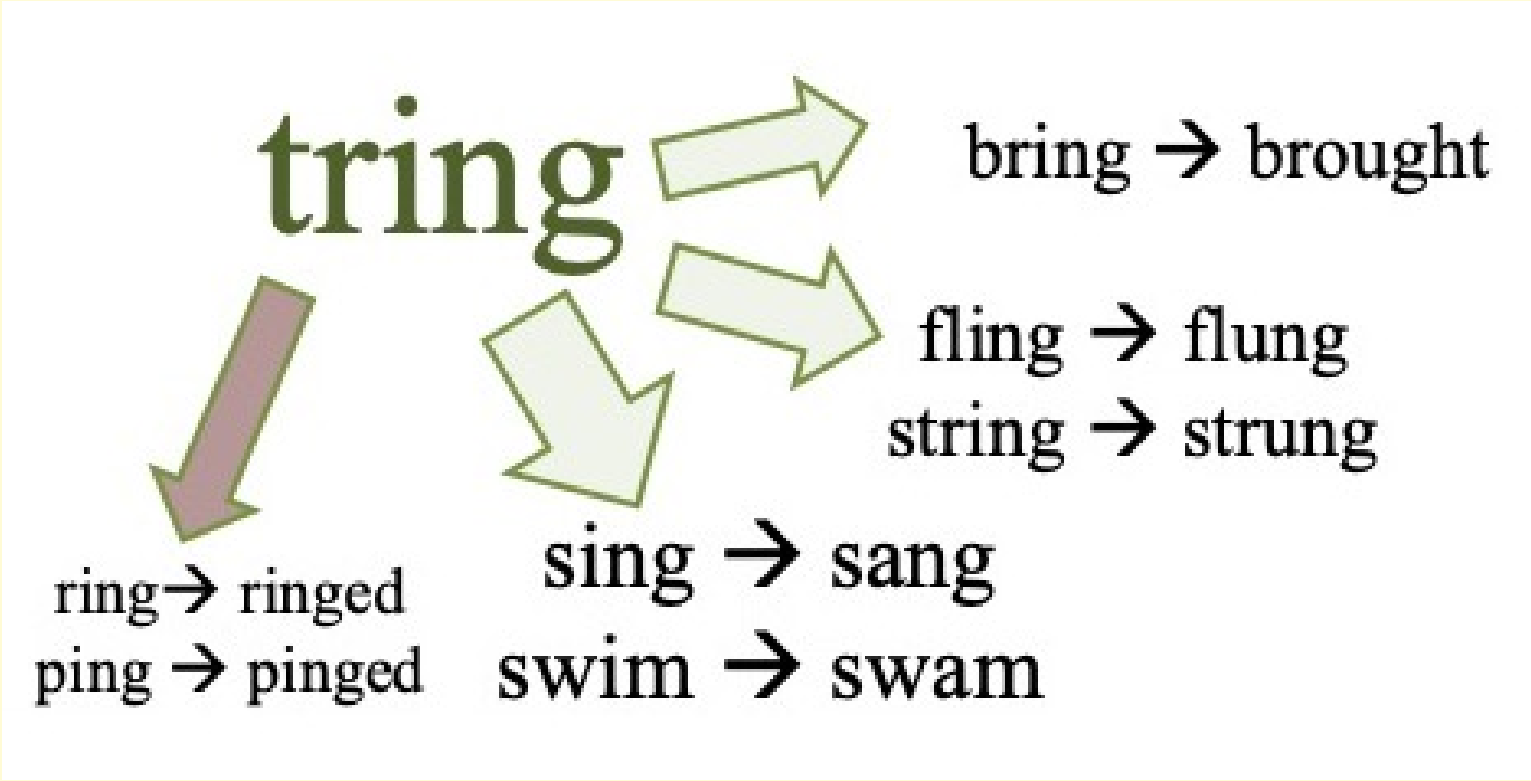
Analogy = the mapping of relationships

What is the past tense of *tring*?

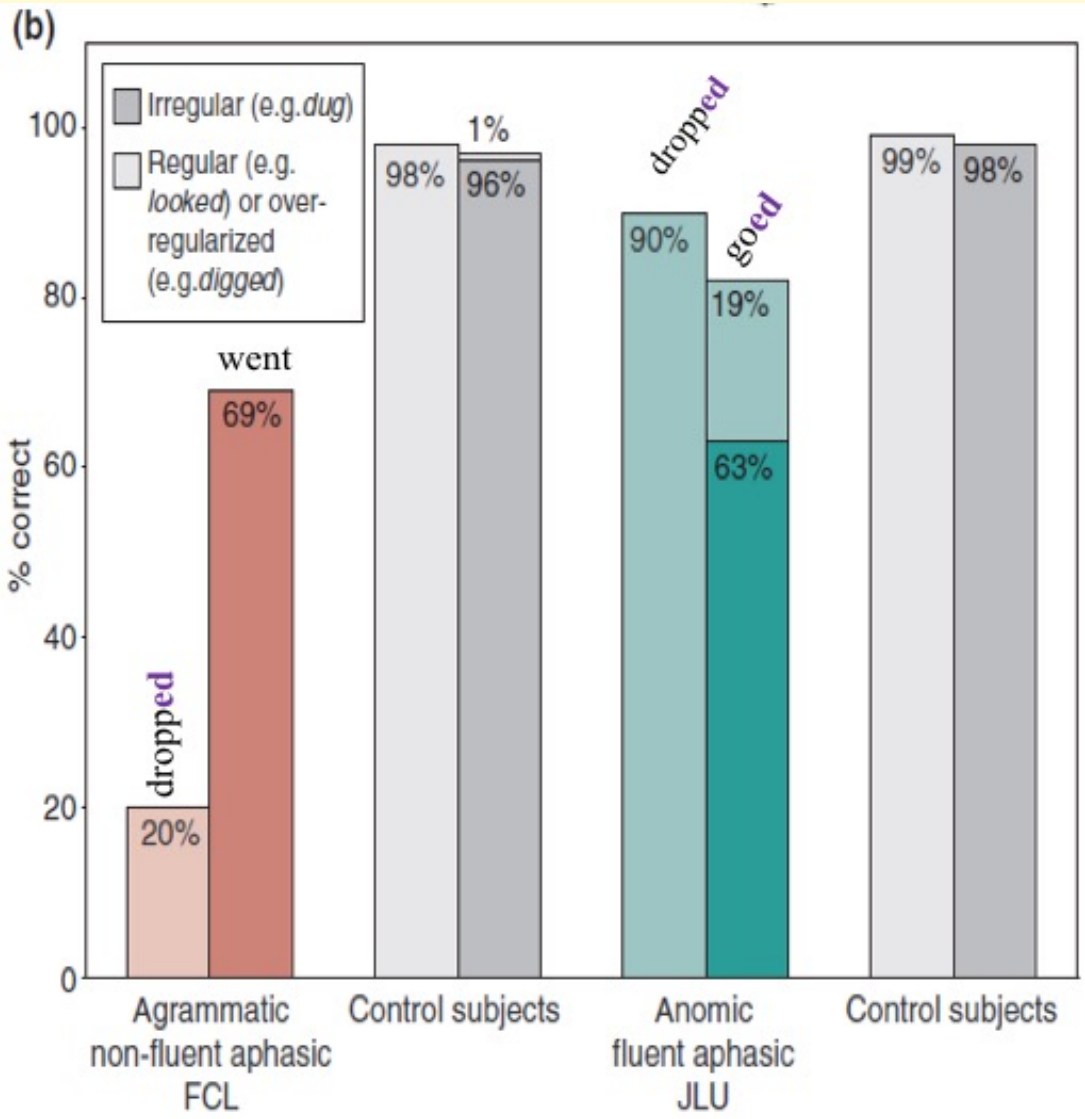
Evidence

Analogy = the mapping of relationships

What is the past tense of *tring*?



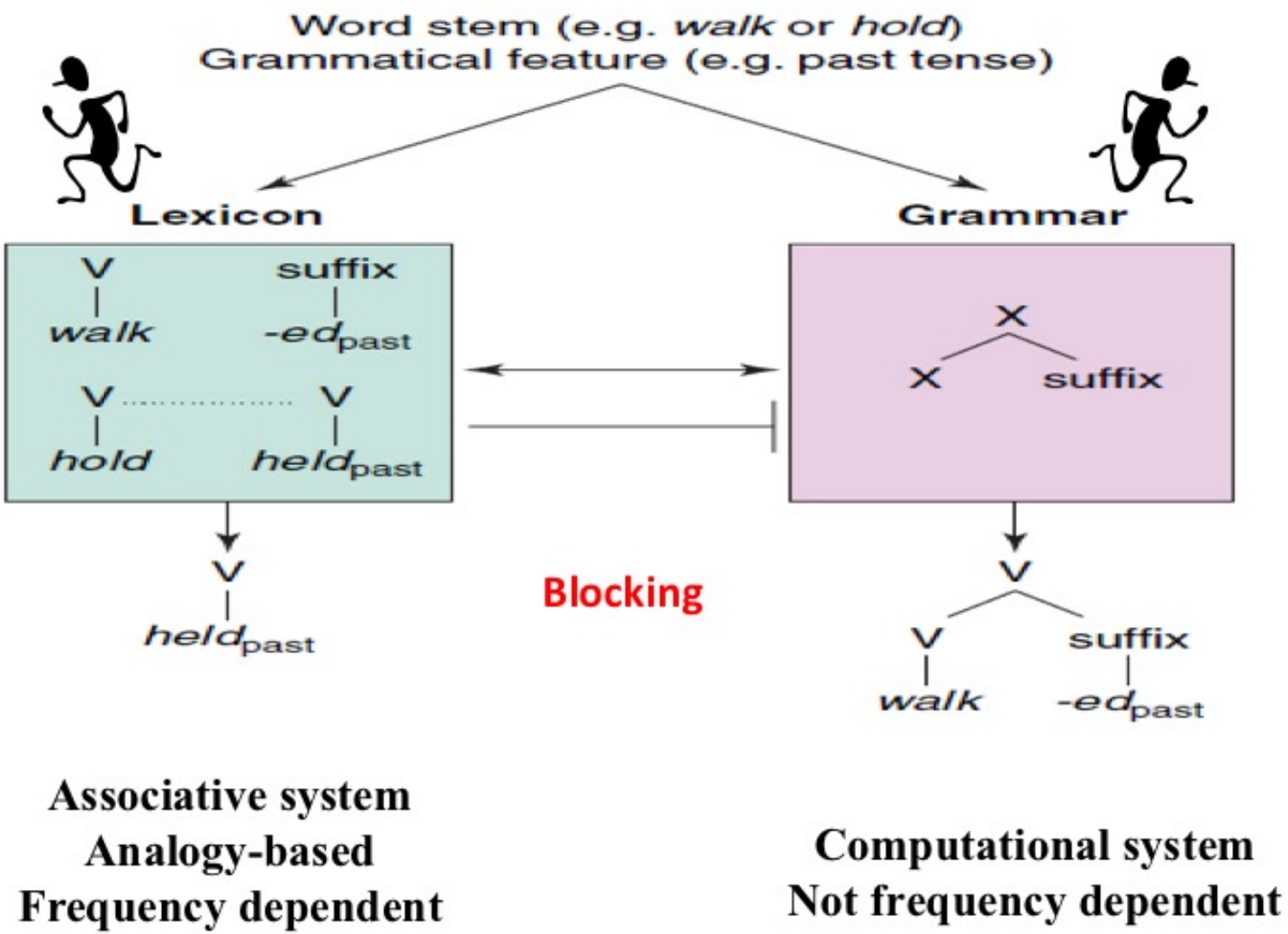
Evidence



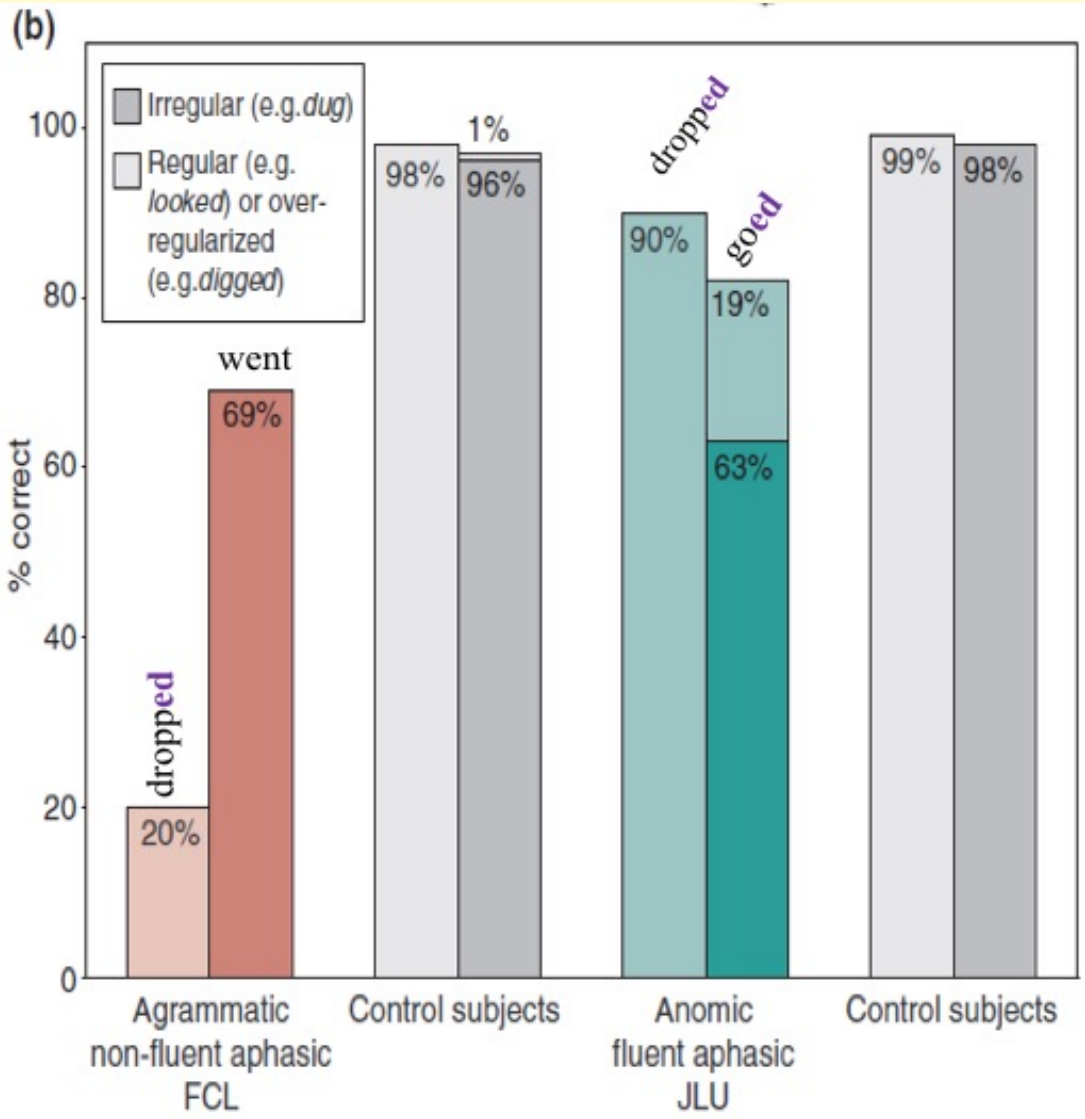
Evidence

Procedural memory affected	Declarative memory affected
IRREG. >better than >REG.	REG. >better than >IRREG.
Dev. Lang. Disorder	Alzheimmers
Parkinsons	Wernicke's type aphasia
Broca's type aphasia	

Evidence



Evidence



Criticism of the dual route model

Joanisse & Seidenberg, 1999.

Irregular system shows characteristics of regular system

meet → *met*, *let* → *let*, *put* → *put*, *shut* → *shut*

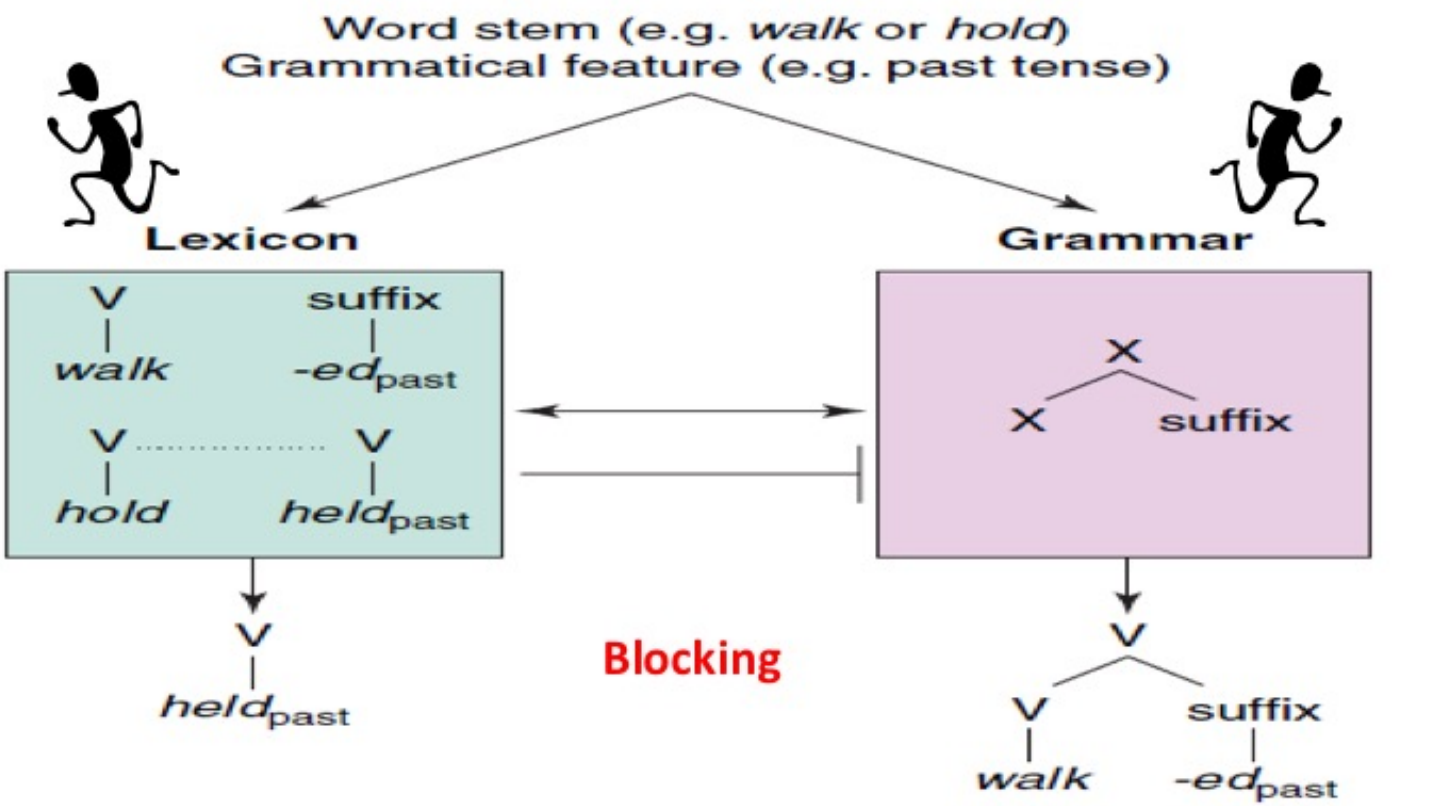
goose → *geese*, *mouse* → *mice*, *moose* → *moose*.

Criticism of the dual route model

Frequency **does** play a role in regular morphology.

e.g. Losiewicz and Alegre & Gordon studies cited above

Criticism of the dual route model



Which one of these sentences did Yoda say in the Star Wars trilogy? Can you explain the reasons behind your choice?

1. Have become powerful you. You the dark side I sense in.
2. Powerful you have become. The dark side I sense in you.
3. Become powerful you have. The dark I sense in you side.

Aitchison, J. (2002). Words in the Mind: An Introduction to the Mental Lexicon (3rd Edition). Wiley-Blackwell.

Alegre, M., & Gordon, P. (1999). Frequency effects and the representational status of regular inflections. Journal of Memory and Language, 40, 41–61.

Joanisse, M. F., & Seidenberg, M. S. (1999). Impairments in verb morphology after brain injury: A connectionist model. Proceedings of the National Academy of Sciences of the United States of America, 96(13), 7592.

Losiewicz, B. L. (1992). The effect of frequency on linguistic morphology. University of Texas at Austin.

Pinker, S., & Ullman, M. T. (2002). The past and future of the past tense debate. Trends in Cognitive Sciences, 6(11), 456–463.

Post, B., Marslen-Wilson, W. D., Randall, B., & Tyler, L. K. (2008). The processing of English regular inflections: Phonological cues to morphological structure. Cognition, 109(1), 1–17. https://doi.org/10.1016/j.cognition.2008.06.011

Ullman, M. T., & Pierpont, E. I. (2005). Specific language impairment is not specific to language: the procedural deficit hypothesis. Cortex, 41(3), 399–433.