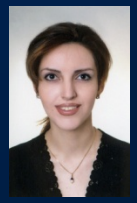
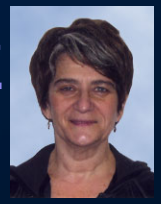
Naming pictures and repeating words

Analysis of aphasic production errors and predictions from computational models





Gary Dell, Nazbanou Nozari, Audrey Kittredge, and Myrna Schwartz

CogSci 2009

July 30, 2009

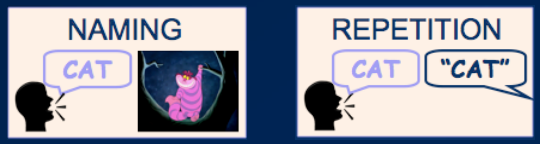
Research goal

- Two most common tasks used to study impaired language production

- Need a theory of how they are related to each other

“Parallel Case Series” approach

Computational case series



DATA

Real case series

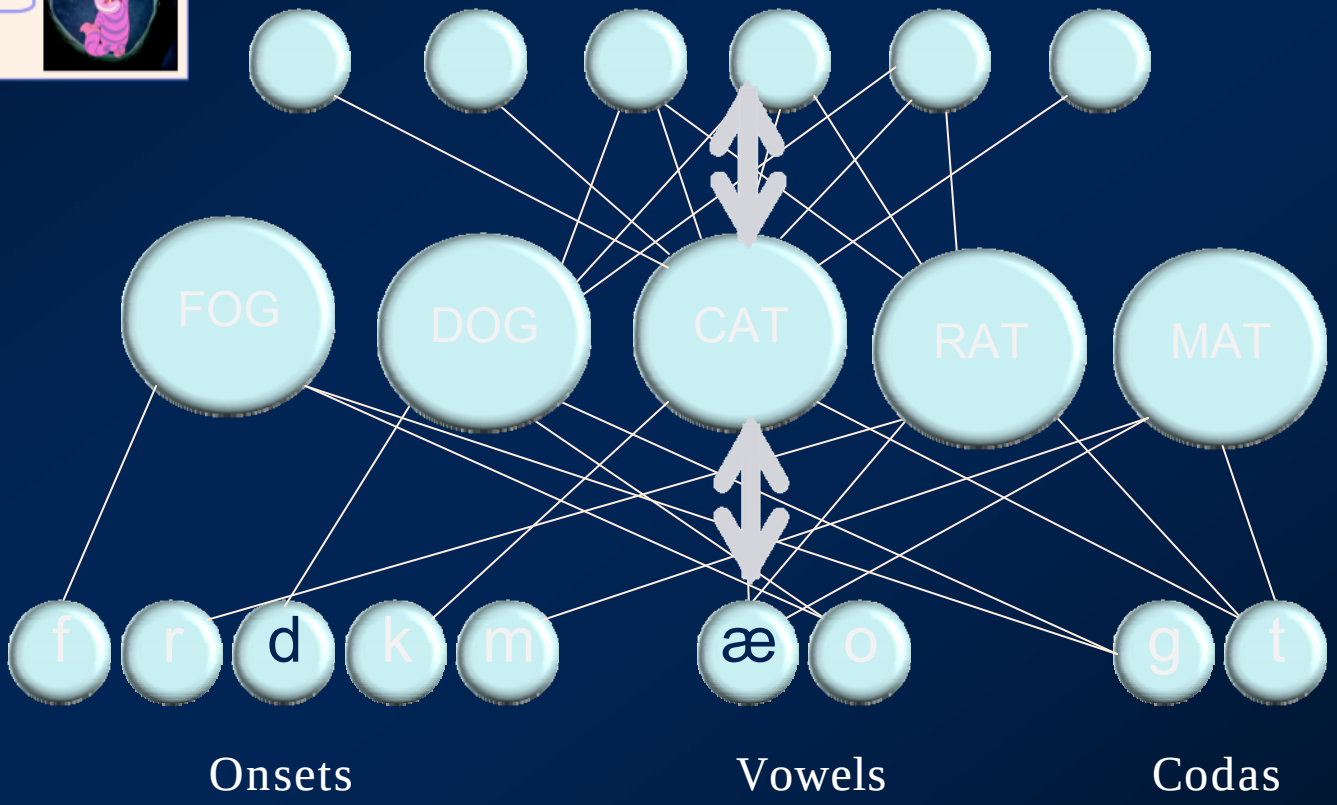
DATA

Identical statistical analysis

Theories of the naming-repetition relationship

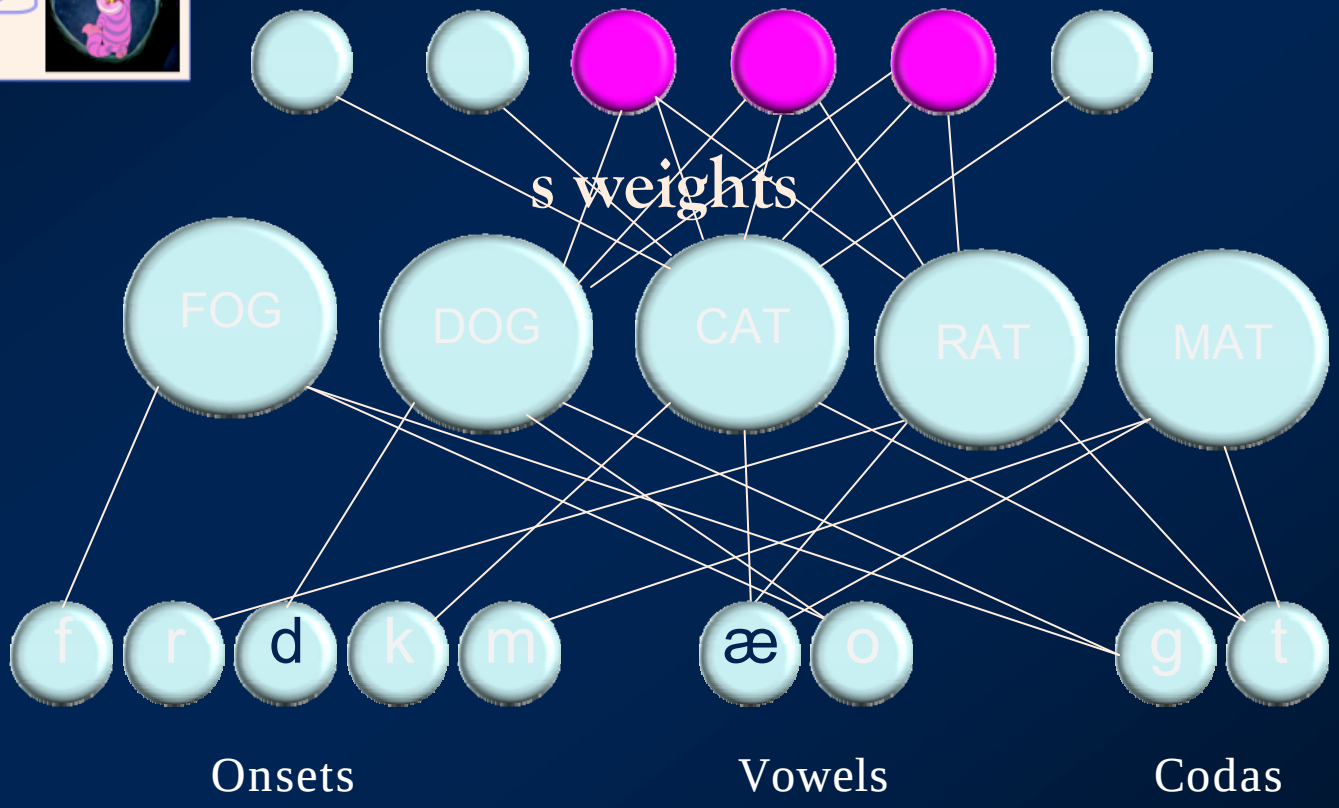
Naming: the 2-step model of lexical access

Foygel & Dell (2000)



Naming: the 2-step model of lexical access

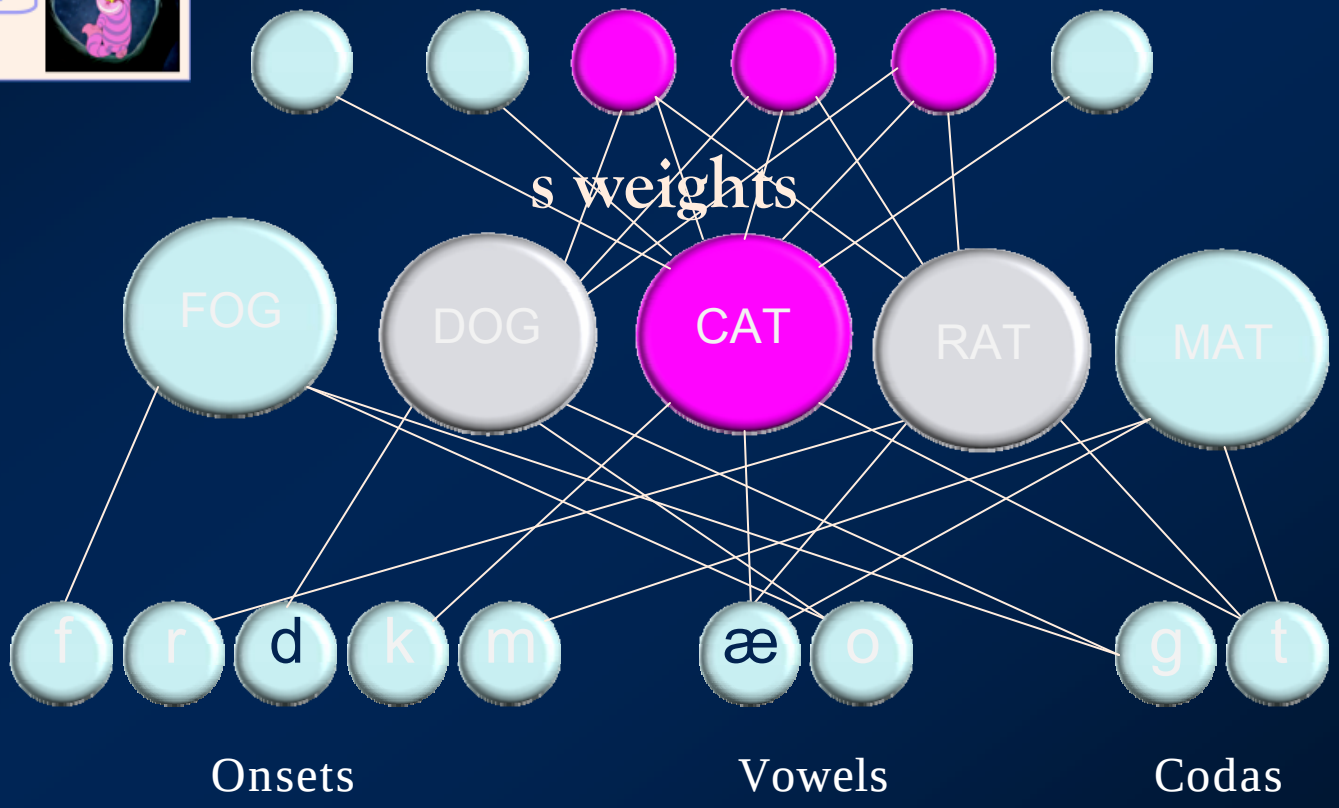
Foygel & Dell (2000)



STEP 1

Naming: the 2-step model of lexical access

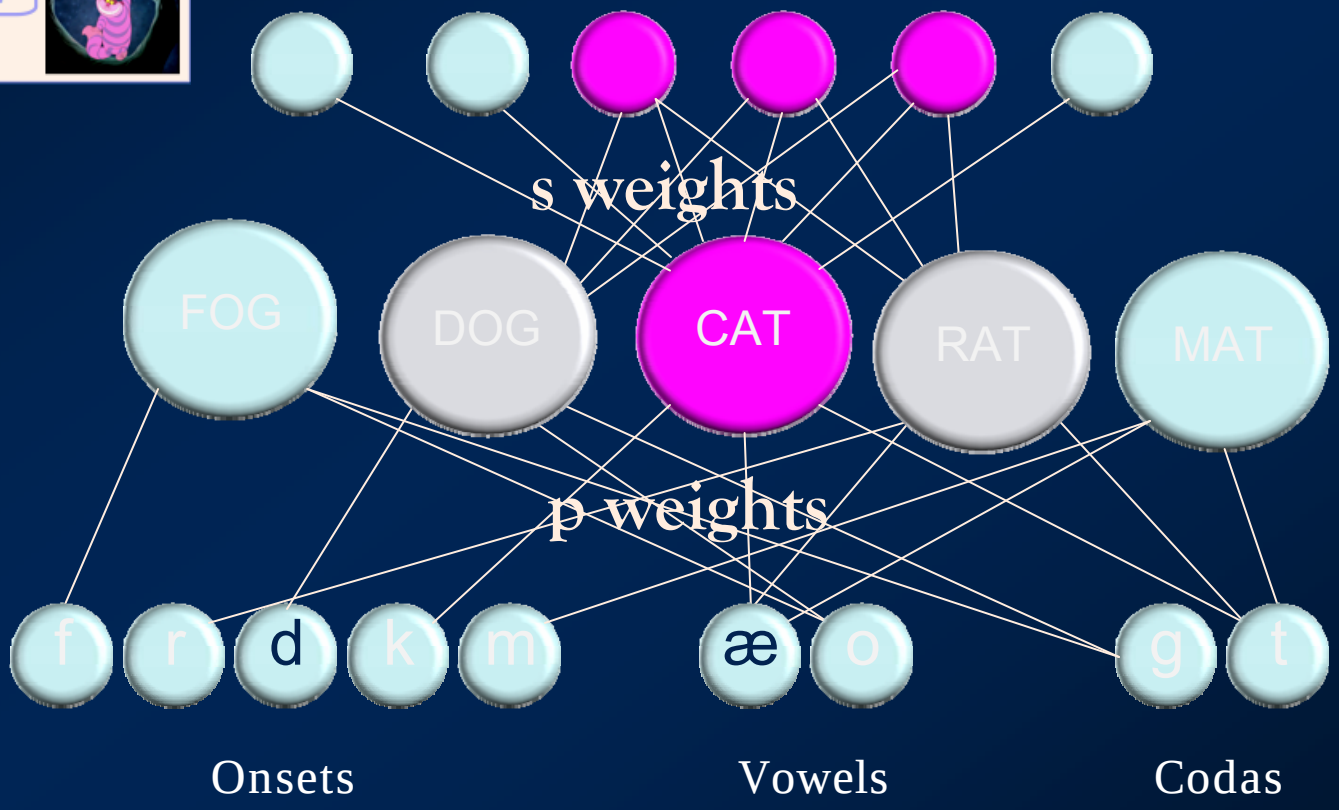
Foygel & Dell (2000)



STEP 1

Naming: the 2-step model of lexical access

Foygel & Dell (2000)

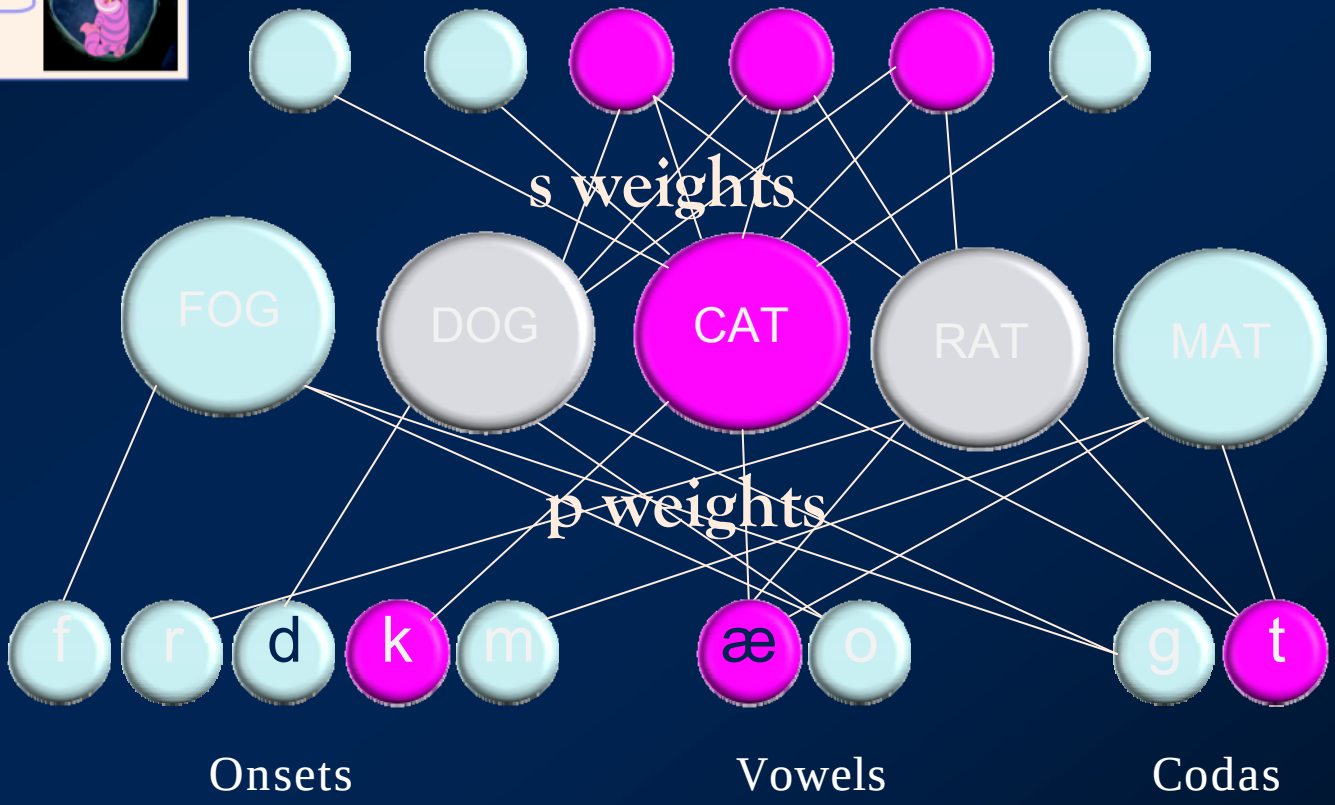


STEP 1

STEP 2

Naming: the 2-step model of lexical access

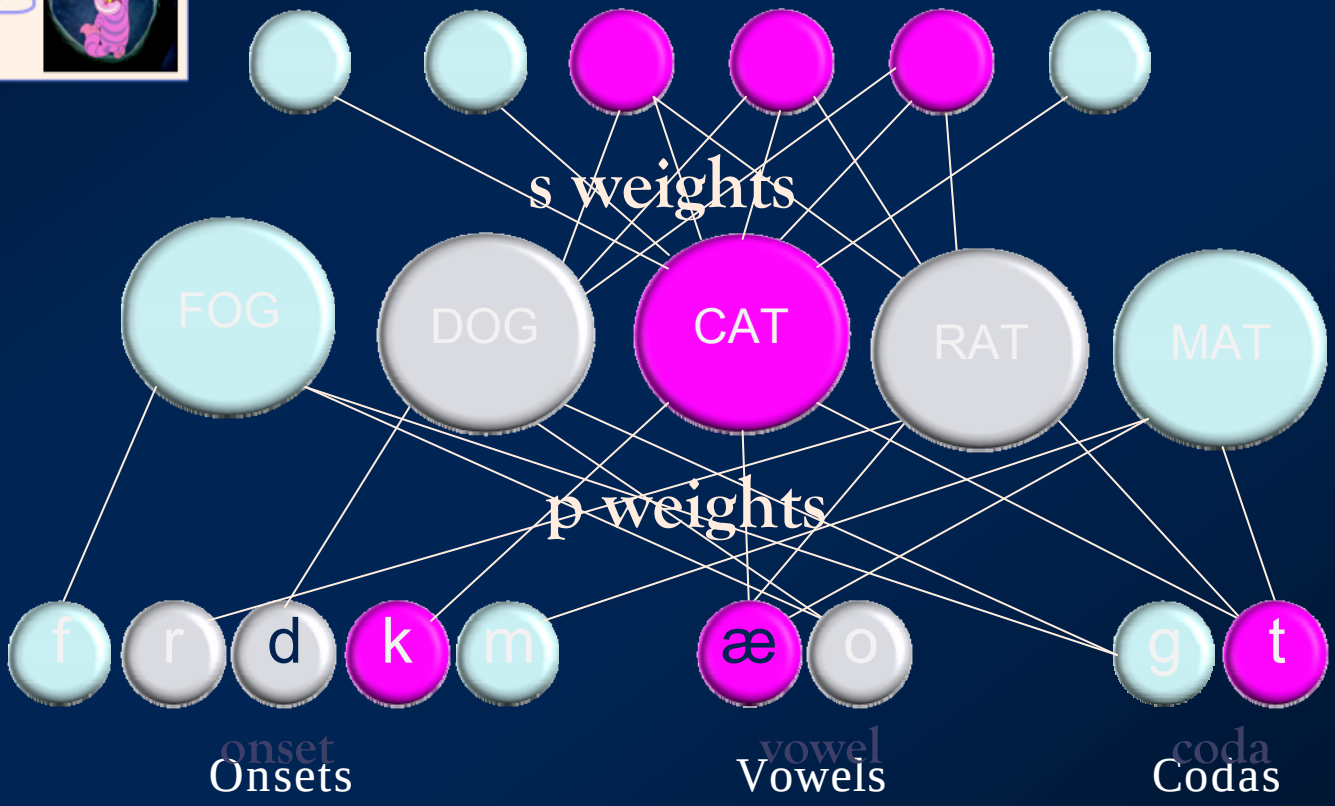
Foygel & Dell (2000)



STEP 2

Naming: the 2-step model of lexical access

Foygel & Dell (2000)



STEP 2

Naming: cartoon model

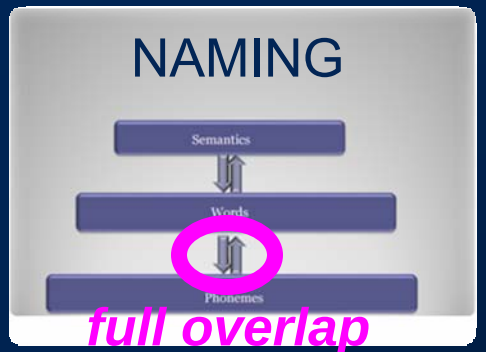
Semantics

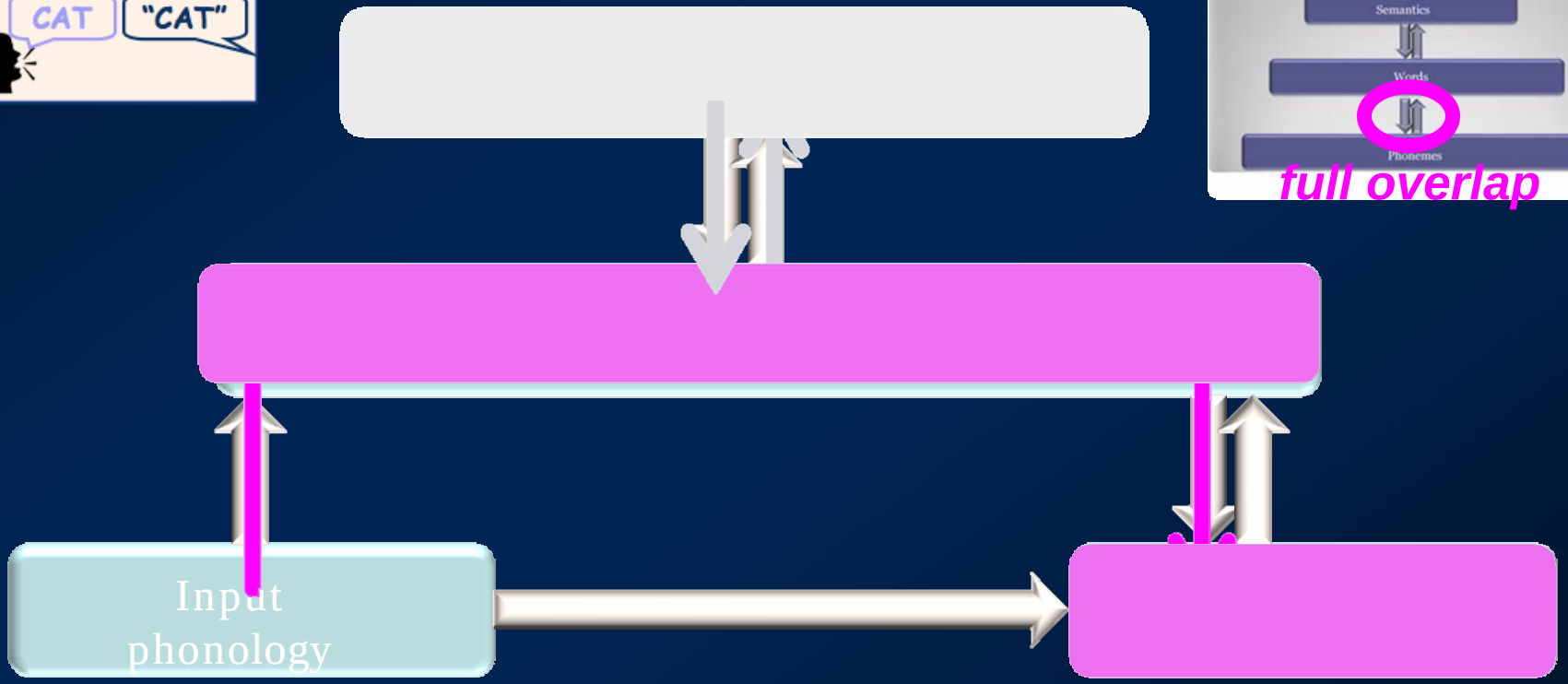
Words

Phonemes

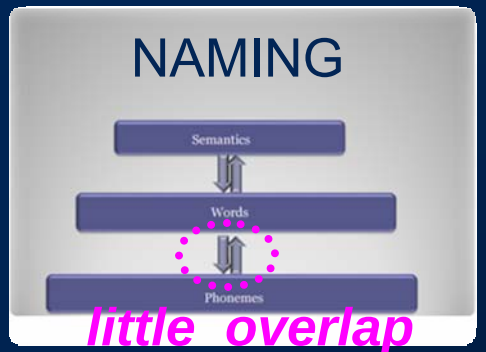
Repetition:
The lexical route model

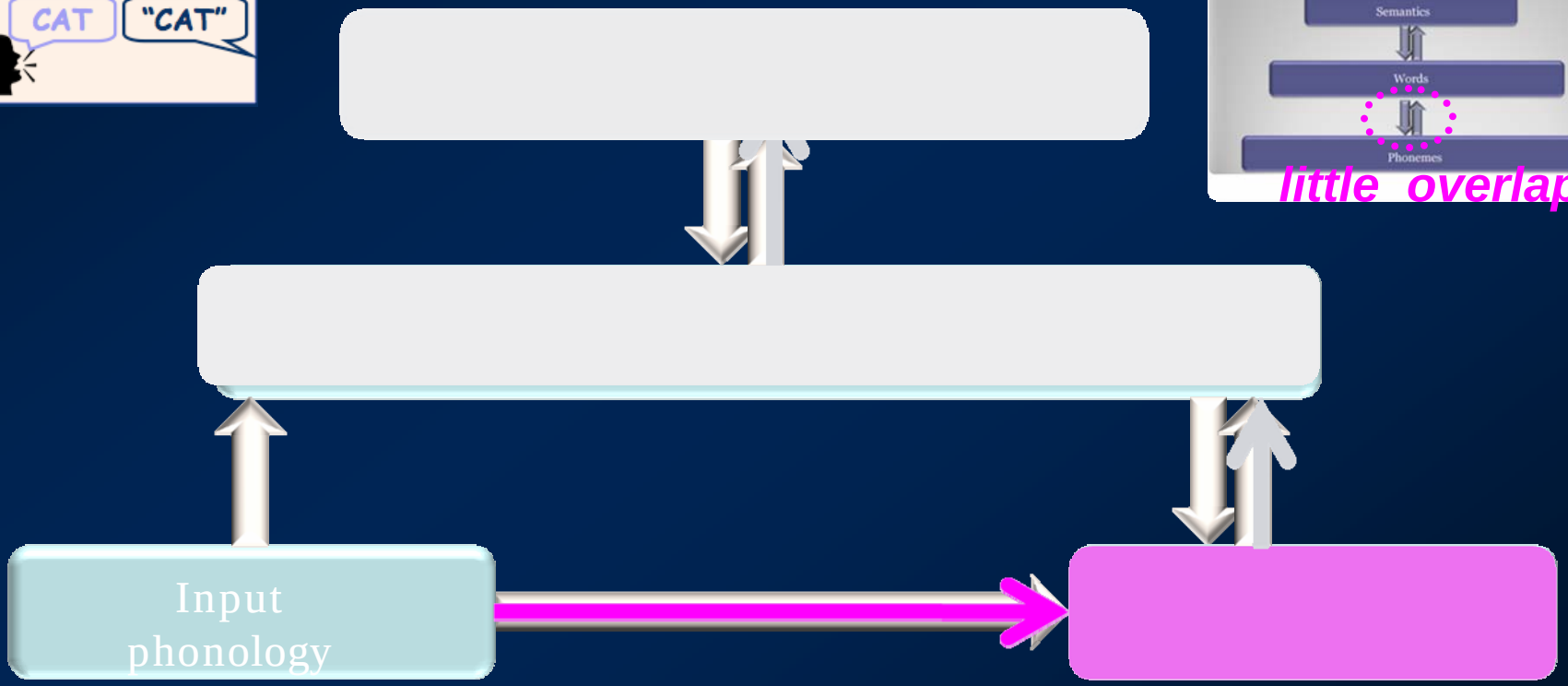
e.g. Dell et al. (2007)





Repetition:
The non-lexical route model

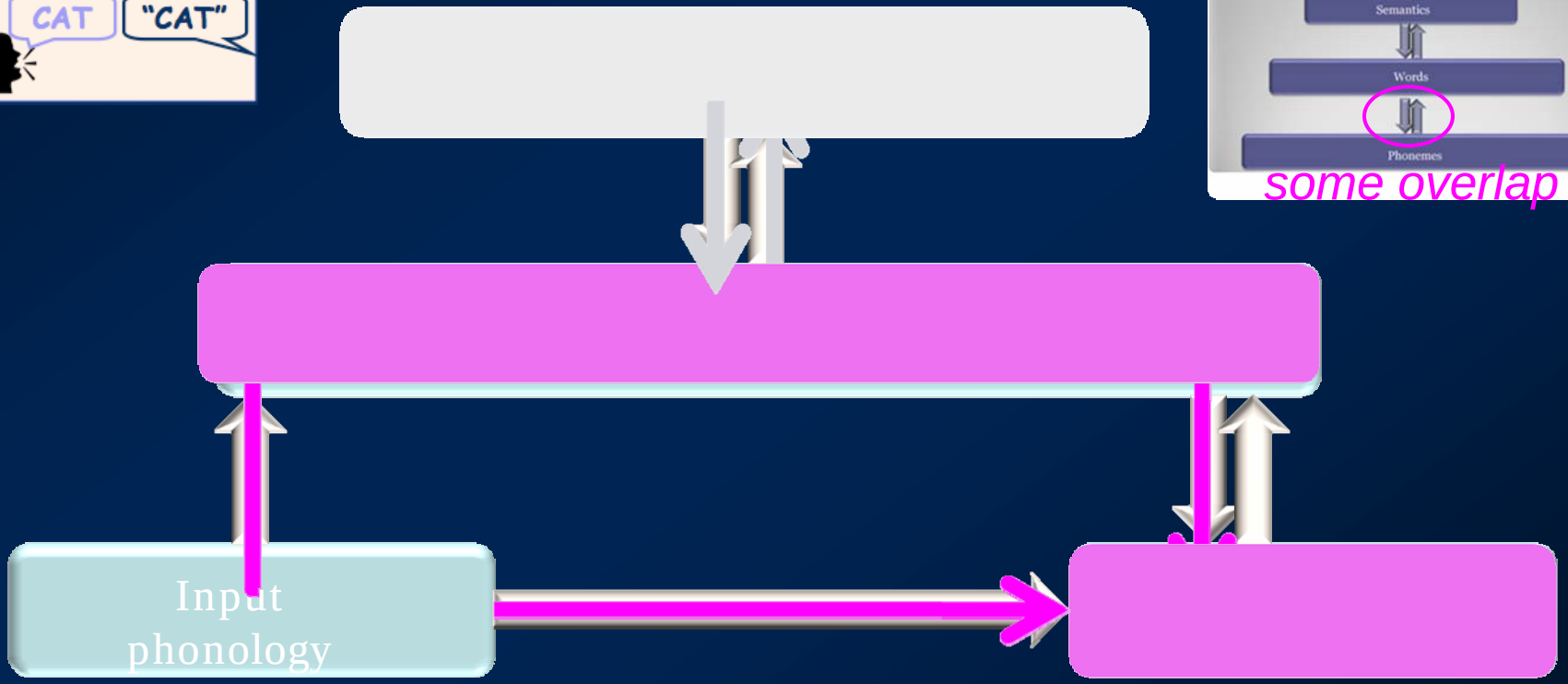




Repetition:
The summation dual route model

e.g. Hillis & Caramazza (1991)

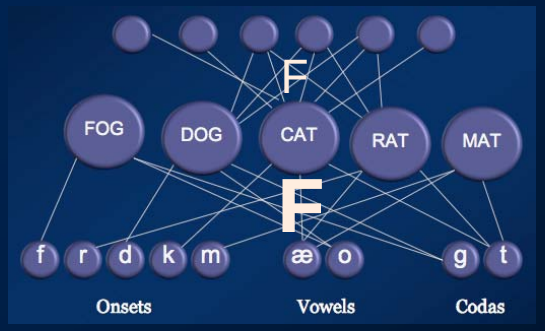
some overlap



Index of step 2 of naming

- Frequency effect
  - high-frequency words are less error-prone in naming *(e.g. Nickels & Howard, 1994)*

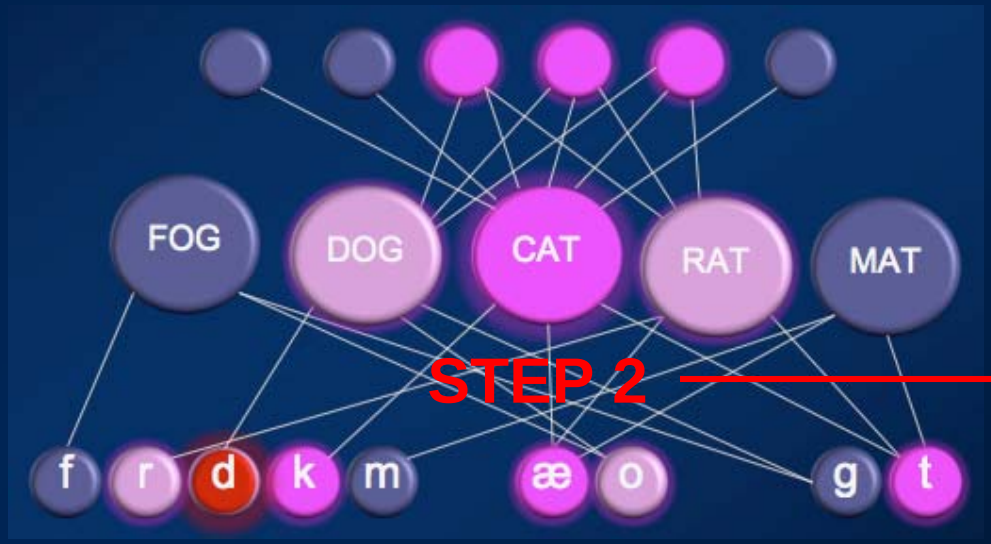
- Felt throughout lexical access, but stronger on the second step *(Kittredge et al., 2008)*



- *The size of the frequency effect in repetition shows the degree of overlap with step 2 of naming*

Index of step 2 of naming

- Frequency effect ***on Nonword errors***



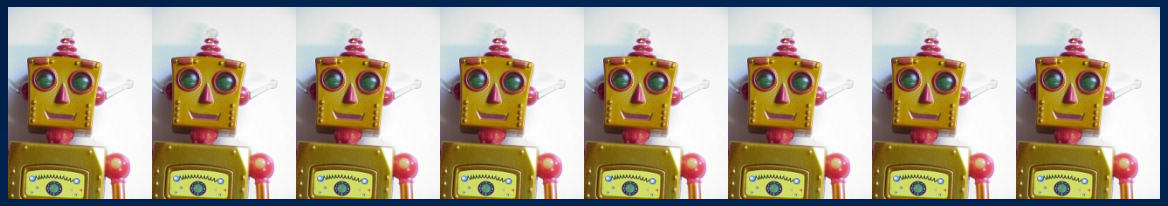
Parallel Case Series approach

1. Computational case series:

simulate effect of frequency in both tasks according to different theories

Simulations

8 digital "patients"
(lesions to s and p weights)



LEXICAL ROUTE

NON-LEXICAL ROUTE

SUMMATION DUAL ROUTE

½ trials high-frequency, ½ trials low-frequency

Parallel Case Series approach

2. Real case series:

assess effect of frequency in both tasks on group performance of aphasics

Aphasic patients

- Non-selective sample of 59 patients
- Left hemisphere CVA
- Naming and repetition with same 175 stimuli

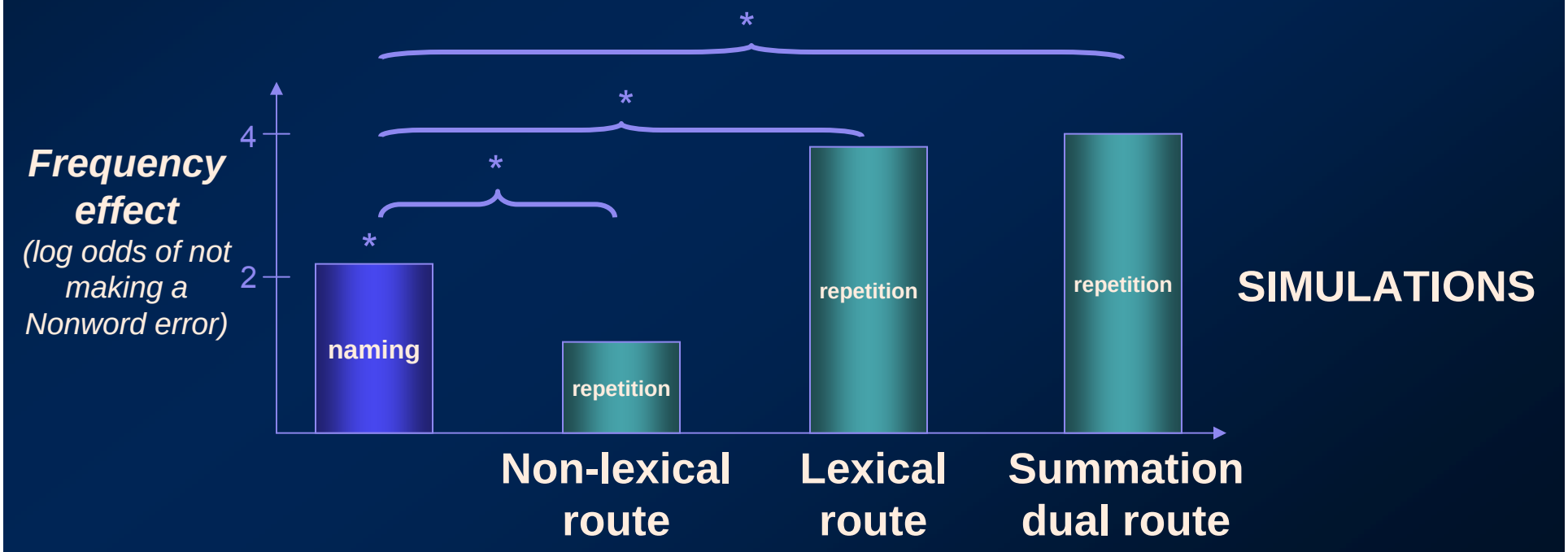
Parallel Case Series approach

3. Apply identical statistical analysis

to simulated and
real patient data

Binomial hierarchical multiple logistic regression

How large is the frequency effect on Nonword errors in word repetition, compared to naming?

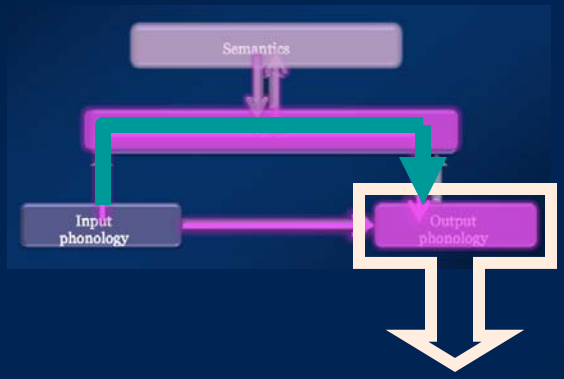


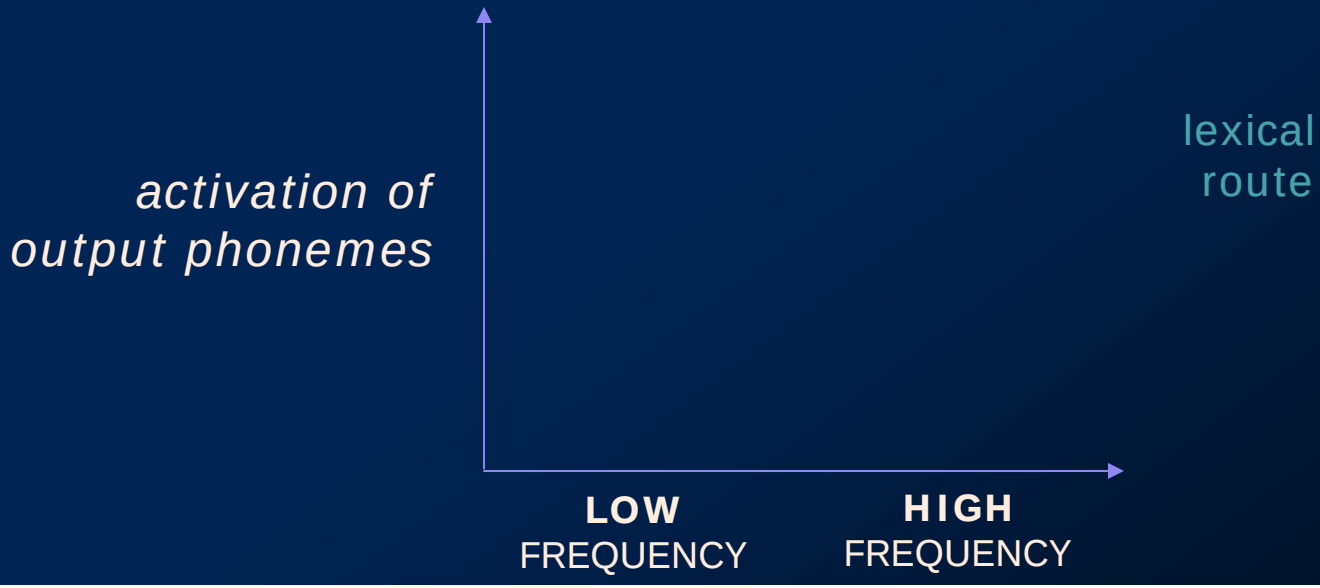
Why does the dual route model behave like the lexical route model?

- Non-lexical route contributes activation without taking away from the frequency effect

Why does the dual route model behave like the lexical route model?

SUMMATION DUAL ROUTE REPETITION MODEL





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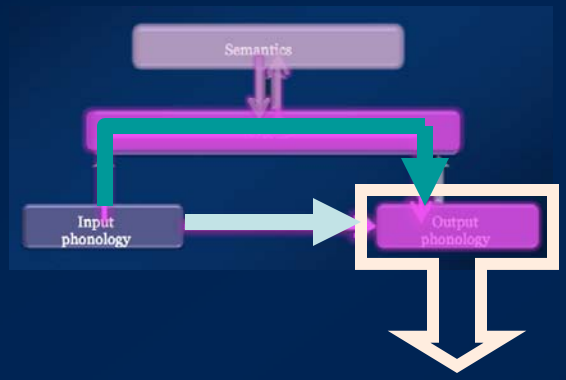
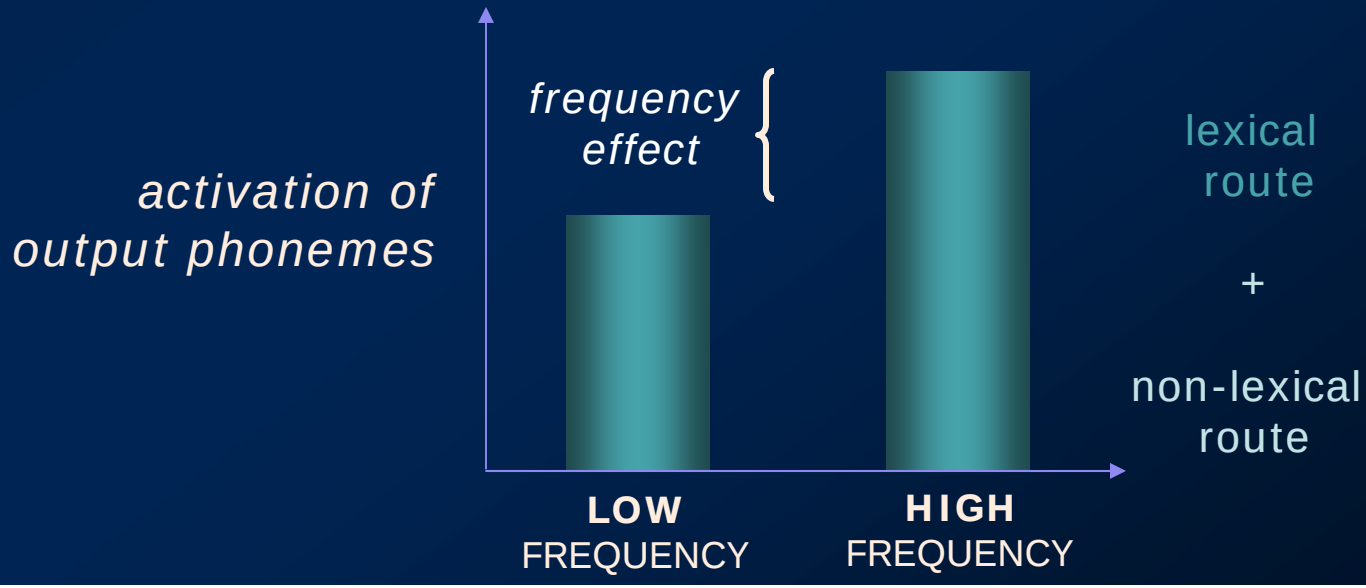
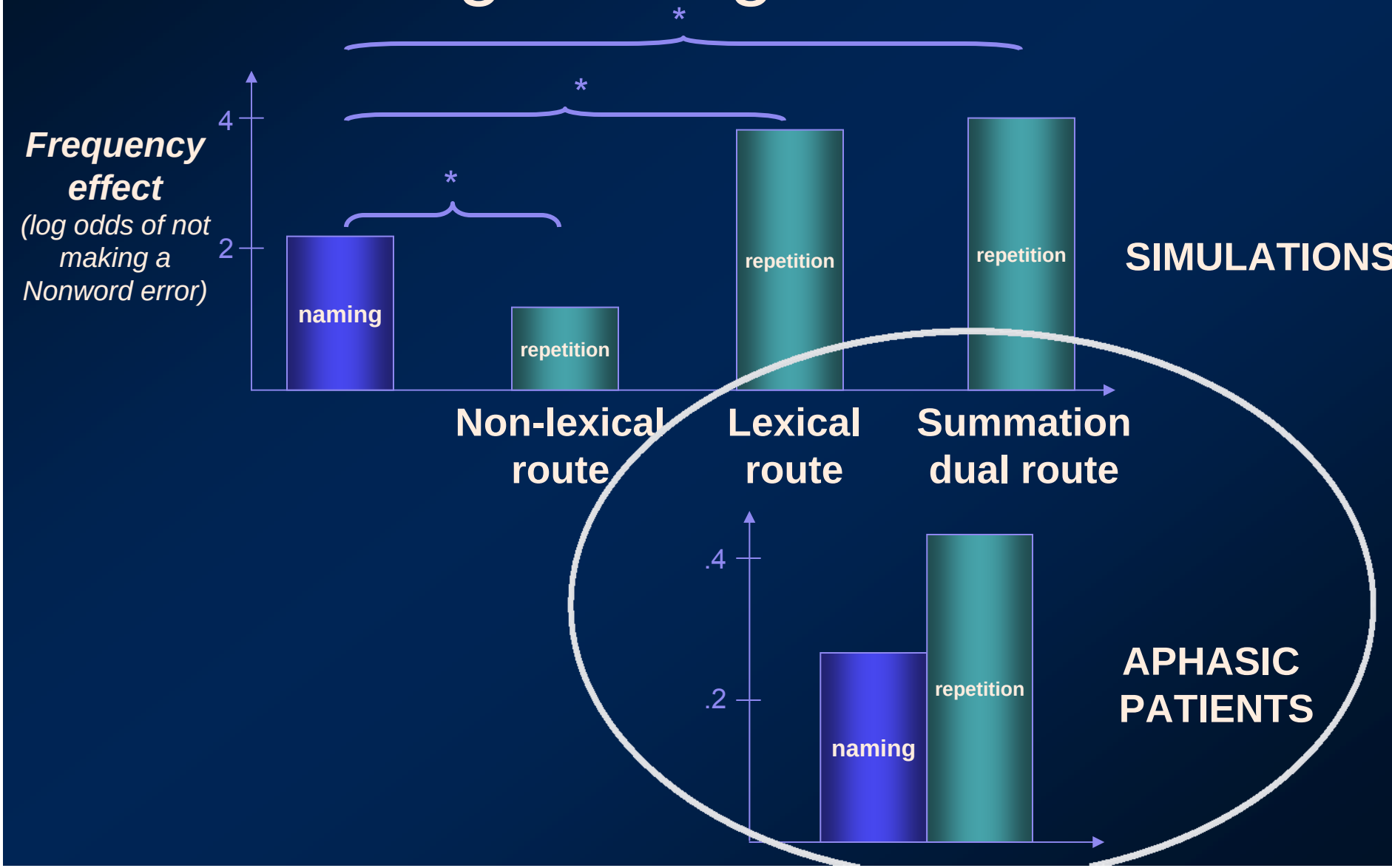
SUMMATION DUAL ROUTE REPETITION MODEL



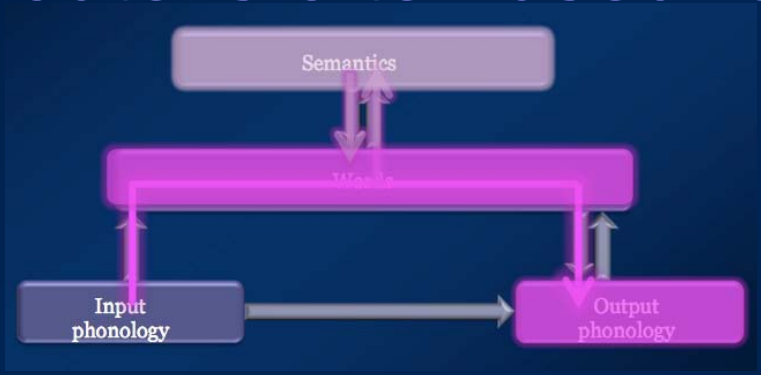


Binomial hierarchical multiple logistic regression

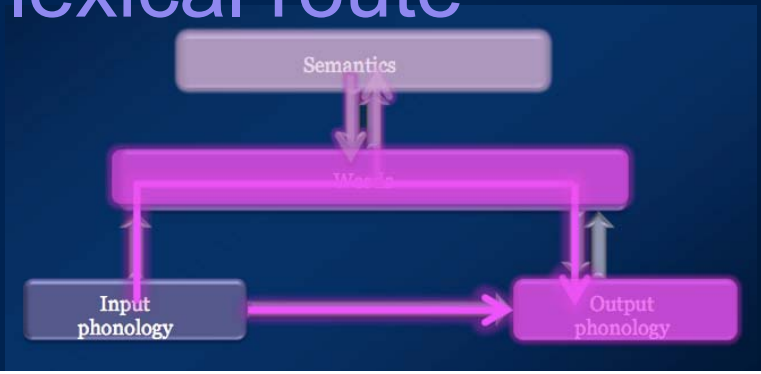


Repetition is fully lexically influenced

- Lexical route is often used repeat words

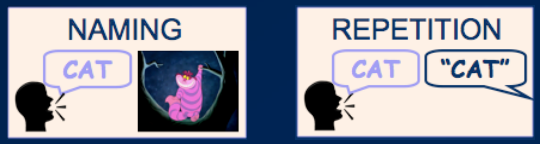


- Individual patients may augment it with the non-lexical route



“Parallel Case Series” approach

Computational case series



DATA

Real case series

DATA

Identical statistical analysis

Thank you

- Gary Dell
- Nazbanou Nozari
- Myrna Schwartz
- Language Production Lab at University of Illinois
- Funding (NIDCD #DC000191)