Paradigmatic Levelling in English: The Influence of Phonological Neighbours

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Background

Lexical Connectivity

Eye-Tracking Study



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• A simplification in the English strong verb paradigm

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#### Background

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- A simplification in the English strong verb paradigm
- Levelling can occur in two possible directions in English

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- A simplification in the English strong verb paradigm
- Levelling can occur in two possible directions in English
  - Participial Shift
    - Levelling from the past participle to the preterite e.g. *I drunk it* or *We seen him there*

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- A simplification in the English strong verb paradigm
- Levelling can occur in two possible directions in English
  - Participial Shift
    - Levelling from the past participle to the preterite e.g. *I drunk it* or *We seen him there*
  - Preterite Shift
    - Levelling from the preterite to the past participle e.g. *I have drank it* or *We should have went too*

## Previous Studies

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• Bybee & Slobin 1982

- $\bullet\,$  Elicited the preterite from adults, third-graders, & children
- Adults & third-graders sometimes produced the past participle verb form as the preterite (e.g. drunk, swum, rung)
- Also produced novel verb forms (e.g. brung, thunk, shuck)

## Previous Studies

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### • Bybee & Slobin 1982

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- Also produced novel verb forms (e.g. brung, thunk, shuck)
- Geeraert 2010
  - Elicited the past participle in two production experiments
    - Spoken version: participants under pressure for time
    - Written version: opportunity to reflect on answer
  - High percentages of Preterite Shift with same verbs (e.g. *have swam* >80% on written experiment)

# Lexical Connectivity

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## Phonological Neighbours

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Conclusions

• Defined as a one-phoneme difference

- *drink* is neighbours with *drank* and *rink*, but not with *slink* or *ring*
- Extracted from the English Lexicon Project (Balota et al. 2007)

# Graph Theory

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Eye-Tracking Study

- A method of measuring the network structure of the lexicon (Vitevitch 2008; Steyvers & Tenenbaum 2005)
- Graph Theory quantifies the interconnectedness of the phonological neighbours

# Graph Theory

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#### Lexical Connectivity

Eye-Tracking Study

- A method of measuring the network structure of the lexicon (Vitevitch 2008; Steyvers & Tenenbaum 2005)
- Graph Theory quantifies the interconnectedness of the phonological neighbours
- We utilized three measures:
  - Degree: number of neighbours
  - Clustering Coefficient: whether the neighbours are neighbours
  - Closeness: measure of the average paths of a verb to all other nodes in the network

# Eye-Tracking Study

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• 120 irregular verbs from Quirk et al. (1985)

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120 irregular verbs from Quirk et al. (1985)
60 'strong' verbs

• distinct forms in the preterite & participle e.g. *drink, drank, drunk* 

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#### Eye-Tracking Study

- 120 irregular verbs from Quirk et al. (1985)
  60 'strong' verbs
  - distinct forms in the preterite & participle e.g. *drink, drank, drunk*
  - 60 'weak' verbs
    - identical forms in the preterite & participle
      - e.g. meet, met, met

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60 'strong' verbs

- distinct forms in the preterite & participle e.g. *drink, drank, drunk*
- 60 'weak' verbs
  - identical forms in the preterite & participle e.g. *meet, met, met*
- Sentences adapted from COCA:
  - Two conditions:
    - Preterite (e.g. I drank an entire bottle of wine)
    - Participle (e.g. I have drunk an entire bottle of wine)

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- Sentences adapted from COCA:
  - Two conditions:
    - Preterite (e.g. I drank an entire bottle of wine)
    - Participle (e.g. I have drunk an entire bottle of wine)
  - Standard or Non-Standard Form:
    - Standard: I drank it or I have drunk it
    - Non-Standard:

*I drunk an entire bottle of wine* = Participial Shift *I have drank an entire bottle of wine* = Preterite Shift

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# Design

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- Head-mounted, video-based eye-tracking device
- Self-paced reading task
- Utilized a Latin-square design
  - Participants saw each verb once in one of the four conditions
- 54 native speakers of English
  - First-year linguistics students from UofA

## Variables

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#### • Response Variable

• Total Fixation Duration (Mean = 379.4, SD = 233.2)

## Variables

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- Response Variable
  - Total Fixation Duration (Mean = 379.4, SD = 233.2)
- Predictor Variables
  - Bybee Verbs: drink, ring, sing, cling class of verbs
  - Condition: preterite or participle
  - Usage: standard or non-standard form
  - Degree: number of neighbours
  - Clustering Coefficient: whether neighbours are neighbours
  - Closeness: average measure of neighbour distances
  - log Frequency: log frequency of the lemma verb form
  - Trial: where in the experiment the item occurred







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### Conclusions



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#### • Levelling in English

- Non-standard forms are processed faster in the past participle than in the past tense
- Preterite Shift is the preferred levelling pattern in English
- Bybee Verbs are processed significantly faster, even in the non-standard (especially in the past participle)

## Conclusions



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### • Levelling in English

- Non-standard forms are processed faster in the past participle than in the past tense
- Preterite Shift is the preferred levelling pattern in English
- Bybee Verbs are processed significantly faster, even in the non-standard (especially in the past participle)
- Structure of the Lexicon
  - Larger neighbourhoods facilitates the processing of non-standard forms
  - Greater neighbourhood connectivity show inhibitory processing effects regardless of usage
  - The distances between the nodes in the lexicon greatly affect processing of Bybee verbs
  - Phonological neighbours significantly facilitate levelling in the direction of Preterite Shift

	Thank You!
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### References

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- Bybee, J. & D. Slobin (1982). Rules and schemas in the development and use of the English past tense. *Language*, *58*, 2, 265-289.
- Balota, D.A., M.J. Yap, M.J. Cortese, K.A. Hutchison, B. Kessler, B. Loftis, J.H. Neely, D.L. Nelson, G.B. Simpson, & R. Treiman. (2007). The English Lexicon Project. *Behavior Research Methods, 39*, 445-459.
- Geeraert, K. (2010). 'I haven't drank in weeks': Preterite shift in English. Unpublished Master's Thesis, University of Alberta.
- Quirk, R., S. Greenbaum, G. Leech, & J. Svartvik. (1985). A comprehensive grammar of the English language. Harlow, UK: Longman.
- Steyvers, M. & J. Tenenbaum. (2005). The large-scale structure of semantic networks: Statistical analyses and a model of semantic growth. *Cognitive Science*, 29, 1, 41-78.
- Vitevitch, M. (2008). What can graph theory tell us about word learning and lexical retrieval. *Journal of Speech, Language, and Hearing Research, 51*, 2, 408-422.