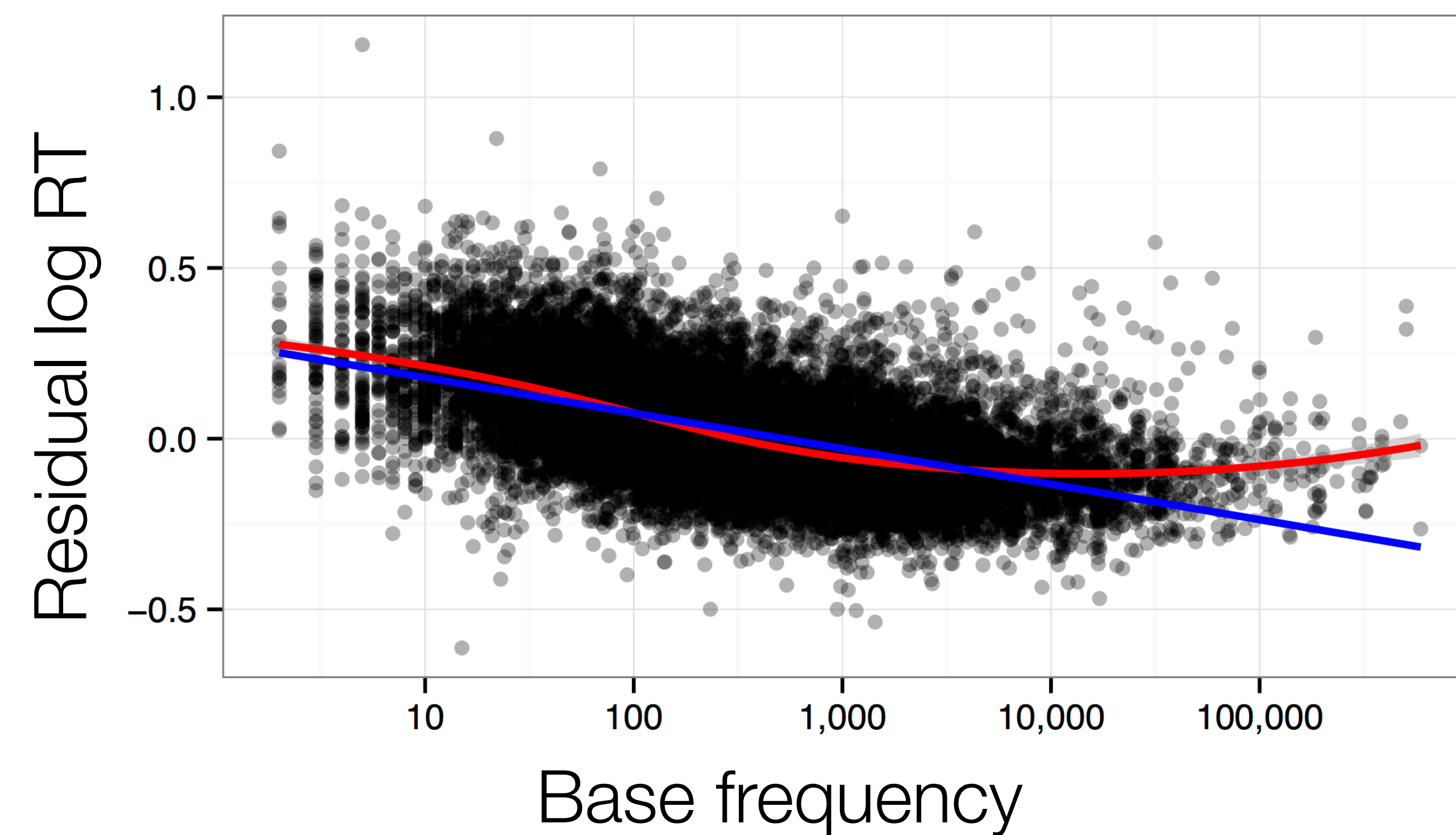


# Toward Lexical Access Mechanisms for Regular and Irregular Forms

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### Frequency effects and lexical access

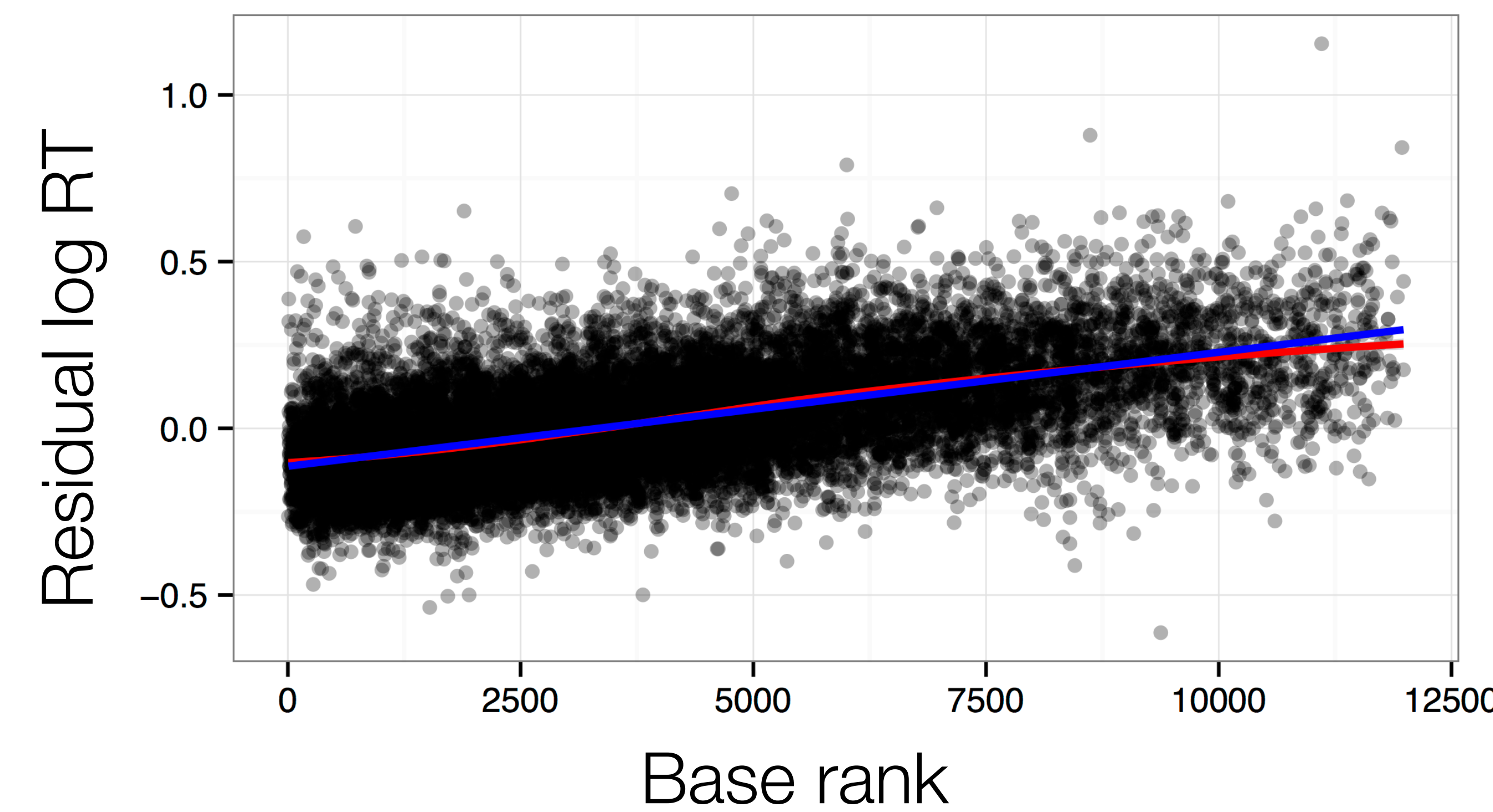
- High frequency words are accessed faster, lower frequency words slower
- Countless findings of effects, but no large-scale examination of *cause* of frequency effects
- We present the first large-scale evidence for a single access mechanism for regular and irregular forms

### Design

- Model lexical decision latencies from the English Lexicon Project (Balota et al., 2007):
  - Regulars (-ed, -ing, -s): 6,681 items, 201,758 trials
  - Irregulars (past tense): 58 items, 1,856 trials
- SUBTLEX frequencies (Brysbaert & New, 2009)
- Residualization to address multicollinearity
- Predict log reaction times (RTs) using mixed-effects linear models with predictors for base frequency, suffix conditional probability, word length, neighborhood density, number of syllables, trial number, subject number, gender, and education level

### Decomposition

- Strong evidence for decomposition of regular forms regardless of frequency (Lignos & Gorman, in press) and of irregular forms (e.g., Stockall & Marantz, 2006)
- Words accessed as bases that combine with affixes (regulars) or rules (irregulars)



### Serial access

- Retrieval by list traversal (Murray & Forster, 2004):
  - ☐ Root 1
  - ☐ Root 2
  - ...
  - ☒ Root N
- Items in memory ordered by descending frequency, predicting faster access for more frequent items
- Mechanism neurally feasible through binning
- Prediction: rank better predictor of access latency than frequency, access time is linear in rank

### Results: regular forms

- Model: inflected forms always accessed compositionally, retrieving base then adding affixes
- Rank of base predicts RT better than frequency
- Lexical decision latency linear in rank
- First evidence of serial access for complex forms, first evaluation of rank effects on large-scale data

### Access for irregulars

- Elsewhere Condition-based models (e.g., SPE, Yang 2005): irregulars represented as list of exception classes traversed before the default form
- Class grouping predicts acquisition data (Yang, 2002)
- Predicts similar-frequency irregulars faster than regulars (Clahsen et al., 2004), rank effect for classes

### Results: irregular forms

- Model: irregulars accessed serially by classes (e.g., rime → /aʊt/ for *think*, *catch*, etc.)
- After word frequency accounted for, class rank is significant predictor of RT ( $\chi^2_{LR}(1) = 7.27$ ,  $p = 0.007$ )
- Traversal of irregular classes estimated to take 22ms

### Extensions

- Exploring other models of irregulars to compare; few can generate appropriate predictions
- Minimum Generalization Learner (Albright & Hayes, 2002) does not learn English irregular patterns reliably

### Conclusions

- Serial access predicts latencies observed in regular and irregular forms: *one mechanism for both*
- First large-scale study of access mechanisms for morphologically complex regulars and irregulars
- Results support models which group irregulars into classes, consistent with acquisition data

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**Acknowledgements:** Thanks to David Balota and Melvin J. Yap for giving us access to the trial-level English Lexicon Project data.