

Mrs. Malaprop's Neighborhood: Using Word Errors to Reveal Principles of Lexical Organization

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Many theories of production assume that retrieval of the target word results in the activation of *neighbors*—non-target words that share its representational structure. Two broad research questions are raised by such proposals:

1. What is a neighbor? What types of non-target words are activated?
2. How do these neighbors influence processing?

Most studies *assume* that neighbors are activated based solely on form overlap (Coltheart et al., 1977; Luce & Pisoni, 1999).

- However, many theories of production assume that multiple factors modulate the activation of non-target words.

Overview of the current study

- **Infer** structure of neighborhoods based on properties of lexical errors in both **spoken** and **written** production.
 - Examine non-semantic lexical errors (lyric → LURID) arising during the retrieval of form information from long-term memory (*lexical retrieval*).
 - Assume these errors are produced because the error word was active during processing of the target—*errors are neighbors*.
- What factors **other than form overlap** influence the activation of neighbors in word production?
 - Examine the influence of: **lexical frequency; grammatical category; length; position of overlap**.

Lexical Errors in Spoken Production

- CSS.** 62 year-old right-handed man (n = 61 lexical errors)
- Stroke resulting in left parietal, right basal ganglia lesions.
 - Errors arise in the course of lexical retrieval in spoken production.
 - Significant effect of lexical frequency.
 - More peripheral deficits ruled out on basis of intact repetition performance.

Lexical Errors in Written Production

- MMD.** 65 year-old right-handed woman (n = 91)
- Stroke resulting in left posterior parietal and superior temporal lesion.
- JDO.** 21 year-old right-handed woman (n = 64)
- Closed-head injury resulting in left frontal, posterior temporal, occipital damage.
 - Errors arise in the course of lexical retrieval in written production.
 - Significant effect of lexical frequency; production of phonologically plausible errors.
 - Graphemic buffer deficits ruled out by absence of significant length effects.
 - Comparable performance in oral & written spelling rules out more peripheral deficits.

Monte Carlo Analysis of Lexical Errors

92% of CSS' errors preserve their target's grammatical category. What does this imply about the structure of neighborhoods? Does it mean that grammatical category influences lexical activation?

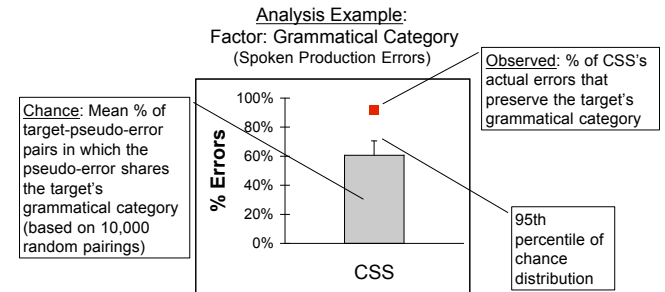
- To interpret observations, we will determine what is expected to occur by **chance** in a system in which form overlap is the **only** factor influencing lexical activation.

For each individual, these predictions were generated by the following analysis:

1. **Control for form overlap:** For each target-error pair, identify all the words in the CELEX database that have the same degree of position-specific form overlap (+/- 10%) as the actual target-error pair—*pseudo-errors*.
2. **Calculate chance based on form overlap alone:** Each target was randomly paired with a pseudo-error; if form overlap alone determines neighborhood structure, the properties of the target-pseudo-error pairs (e.g., the rate at which they share grammatical category) should be comparable to those of the actual target-error pairs. (10,000 random pairings were generated to estimate the chance distribution.)

The observed values of the actual errors are then compared to chance values.

- If the properties of the actual errors fall outside the 95% confidence interval of the chance distribution, factors other than form overlap must be influencing lexical activation.

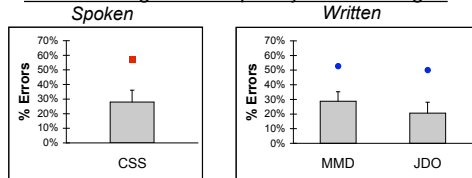


Conclusion: Because the observed errors share the target's grammatical category more often than predicted by form overlap alone, we can conclude that grammatical category information contributes to the process of lexical retrieval.

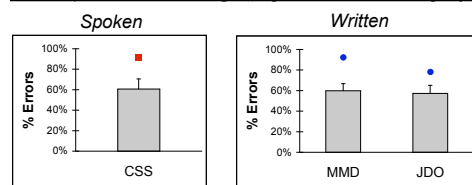
Results

Lexical Factors Influence Activation of Neighbors

Errors are higher in frequency than the target.

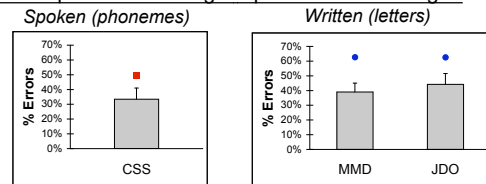


Errors preserve the target's grammatical category.



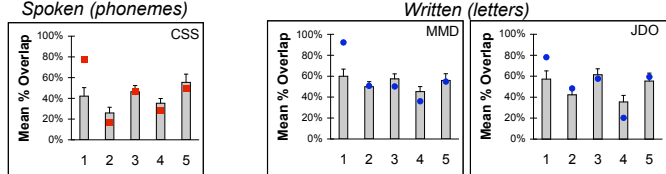
Length, Initial Overlap Influence Activation of Neighbors

Errors preserve the target's phoneme/letter length.



Errors preserve phoneme/letter identity in initial position.

Note: phonemes, letters collapsed into 5 positions (after Wing & Baddeley, 1980)



Discussion

1. The **same** principles drive activation of neighbors in written and spoken modalities.
 - These principles reflect common pressures on production and/or memorial mechanisms in both speech and writing.
2. Lexical properties of target—frequency and grammatical category—influence activation of neighbors.
 - Supports theories incorporating cascading activation between word- and form-based processes in production (Rapp & Goldrick, 2000).
3. Target length influences activation of neighbors.
 - Supports theories incorporating wordshape planning frames in lexical retrieval (O'Seaghdha & Marin, 2000).
4. Overlap in initial position exerts an influence on activation beyond overall form overlap.
 - Supports theories according a special role to initial positions in phonological encoding (Shattuck-Hufnagel, 1992).

References

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