

Background

- Popular models of spoken word recognition differ on phoneme-level inhibition:
- **TRACE – YES phoneme-level inhibition**
 - That is, automatic competition between phonemes at a pre-lexical level of representation (McClelland & Elman, 1986)
- **Shortlist/Merge – NO phoneme-level inhibition**
 - Rather, hearing one phoneme also activates other similar phonemes in a **gradient** manner (Norris, 1994; Norris, McQueen, & Cutler, 2000)

Research Question

- Can evidence for phoneme-level inhibition be found using auditory lexical decision?
- In other words, will hearing a sound make it harder for participants to process other similar sounds soon after?

Design and Method

- To demonstrate **phoneme-level inhibition**, need to rule out two things:
 1. **Lexical competition effects**
 - Which produce inhibitory effects due to feedback down into the phoneme-level (e.g., Hamburger & Slowiaczek, 1996)
 - Solution: Priming with isolated sounds instead of words
 2. **Post-lexical strategic processing**
 - That is, changes in RT due to strategies adopted by participants
 - Solution: Short inter-stimulus intervals (ISIs)
- **Task: Auditory lexical decision**
 - Participants heard target words preceded by isolated sounds as primes
 - **Example:**

* → [s] ... 'gas' → ????

Visual Fixation Prime (Auditory) ISI Target (Auditory) Response
- Responses were made with keys marked 'word' and 'non-word'

Design and Method

- Manipulated 2 independent variables:
 1. **Relatedness** of the prime sound to the final phoneme of the target word
 - 3 within-subjects levels:
 - Identical (e.g., [s] ... 'gas')
 - Similar (e.g., [s] ... 'wash')
 - Unrelated (e.g., [m] ... 'gas') – used as baseline
 - Effects of offset overlap better understood in the literature (see McQueen & Sereno, 2005 for discussion)
 2. **ISI** (time between prime and target)
 - 3 between-subjects levels
 - 50 ms
 - 250 ms
 - 500 ms
- Participants:
 - 33 UCLA undergraduates (11 per ISI group)
- Stimuli:
 - [s], [ʃ], and [m] were used as primes
 - 24 CVC or CCVC words, half ending in [s] and half ending in [ʃ], were used as experimental target words. The initial segments did not included one of the prime sounds.
 - 24 filler words were chosen, not ending or beginning with one of the prime sounds
 - 48 CVC or CCVC non-words were also constructed
- Control methods:
 - The 24 experimental words were divided into 3 lists of 8 words each
 - Each list matched for frequency and lexical neighborhood density
 - For a given participant, each list was assigned to one of the Relatedness conditions
 - To control for item effects, the lists were counterbalanced across subjects, such that:
 - Every item paired with every Relatedness condition
 - Every item paired with every prime
 - Every item presented at every ISI

Predictions

- **If YES phoneme-level inhibition:**
 - Similar condition should have *higher* RTs than Unrelated and Identical
- **If NO phoneme-level inhibition, YES gradient activation:**
 - Similar condition should *not* have higher RTs than Unrelated. If any differences are found, they should be Identical < Similar < Unrelated

Results

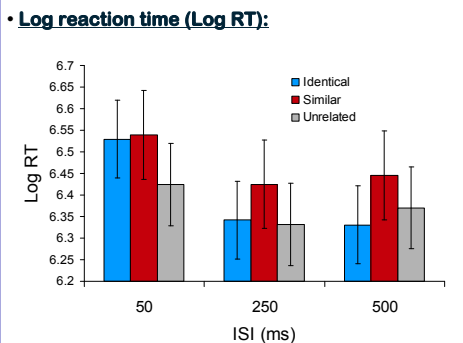


Figure 1. Mean Log RT as a function of ISI and Relatedness (with standard error bars).

- Overall, participants were *slower* to respond in the Similar condition than in the Unrelated condition ($p < .01$).
- Participants were also slower to respond in the Similar condition than in the Identical condition overall ($p < .05$).

• **Error Rate:**

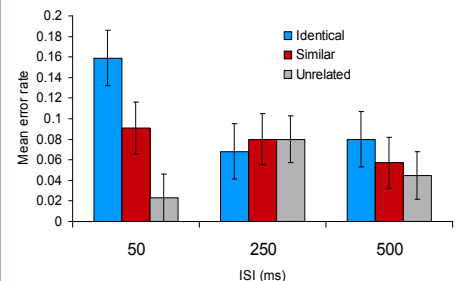


Figure 2. Mean error rate as a function of ISI and Relatedness (with standard error bars).

Results

- Surprising result !! – Accuracy for the Identical condition at a 50 ms ISI was quite poor – even worse than for the Similar condition.
- No differences based on Relatedness for the other ISIs.

Conclusions

- Words are recognized more slowly when preceded by similar sounds than when preceded by identical or unrelated sounds.
- These results support models of spoken word recognition containing phoneme-level inhibition.
- No support for models with gradient activation (in the absence of inhibition).
- Something (e.g., fatigue effects) is hindering recognition of words preceded by identical sounds at very small ISIs.

Future Directions

- Replicate the study using a shadowing task
- Directly compare priming with isolated sounds vs. priming with words
- Determine the cause of the poor accuracy in the Identical condition at the 50 ms ISI.

References

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