Not as perfect as assumed: Phonological effects in adults' letter-sound knowledge

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So far, literacy research has shown little interest in the phonological abilities of skilled readers. Literacy acquisition promotes phoneme awareness. It has been implicitly assumed that literate adults use phonemes as units when considering relationships between letters and sounds. However, some studies (e.g. Scarborough et al., 1998; Moats, 1994, Scholes, 1994) have recently suggested that:

- Adults’ representations of letter-sound relationships are not necessarily based on phonemes
- Adults sometimes fail to delete/count phonemes accurately in phoneme awareness tasks
(Scarborough, Ehri, Olson & Fowler, 1998)
Most prominent type of error was to group together letters corresponding to more than a single phoneme

We could just assume that these responses occur at random and indicate poor phonemic awareness

However, effects of phonological factors (e.g. onset-rime structure, word stress, syllables)
Useful to remember...

- Phonemes are not invariant concepts in speech.
- They are important in literacy acquisition because the alphabet in principle represents language on the phoneme level.
- Even if phonemes become more salient during literacy acquisition, this process need not result in a strategy based exclusively on phonemes.
- Adults’ responses could be systematically guided by phonological attributes other than phonemic segments.
Why should we care?

• Implications for teacher training
  – If knowledge of phoneme-letter correspondences cannot be assumed, specific training should be included in the curriculum

• Reading and spelling models
  – Consolidation of larger “chunks” of letters/phonemes at more advanced levels of skill
Two possible phonological influences

1. **Sonority, i.e. vowel-likeness**

<table>
<thead>
<tr>
<th>sonorant</th>
<th>vowels</th>
<th>liquids</th>
<th>nasals</th>
<th>obstruents</th>
</tr>
</thead>
<tbody>
<tr>
<td>least</td>
<td>/r/, /l/</td>
<td>/n/, /m/</td>
<td>/k/, /t/</td>
<td></td>
</tr>
</tbody>
</table>

- Sonority effects in adult processing have been found in several different studies
  - Sonorant consonants are more closely associated with the vowel of the syllable (e.g. MILK)
  - Obstruent consonants are more closely associated with the consonant coda of the syllable (e.g. DUSK)
  - Nasals are intermediate
2. Letter names

- Many words contain phoneme/letter sequences that correspond to letter names, e.g. hard /ɑr/, help /ɛl/, went /ɛn/
- Children’s spelling and phonological awareness are influenced by letter names
- Also some evidence of letter-name processing in skilled readers, for example in phoneme counting
Research Question

• What types of phonological units do adults associate with letters?
  – Do phoneme sonority and embedded letter names in words influence adults’ explicit judgements of phoneme-letter relationships?
Predictions

• If adults’ performance is influenced by sonority and letter names they would be likely:

1. To group sonorant consonants together with the adjacent vowel (e.g. grid, gulp)
2. To group less sonorant consonants with the adjacent consonant (e.g. stab, dusk)
3. To group together letters forming a letter name (e.g. cart, helm, dean)
Participants

- Sixty undergraduates at Washington University who all had English as their first language
- We excluded participants who had taken courses in linguistics and speech science or had experience in teaching young children to read and spell
- Testing was done by an American speaker
Spelling segmentation task

- Participants saw written words and heard them pronounced.
- They were asked to circle the letter or group of letters in the spelling of each word that corresponded to individual sounds in the pronunciation of the words.

- dog
  - d o g
- Phil
  - P h i l
- moon
  - m o o n
Stimuli

1. Sonority items:
   - 24 words with initial consonant clusters (CCVC)
     - e.g. crib, slug, snob, skim
   - 24 words with final consonant clusters (CVCC)
     - e.g. fork, gulp, ramp, mask
   - Targets were the consonants preceding or following the vowel
   - These varied in terms of sonority, from the very sonorant /r/ and /l/ to the less sonorant nasals (/n/, /m/) and the least sonorant obstruents (e.g. /k/, /s/)
2. Letter-name items
   • 18 CVCC words that contained one of the VC letter names
     – e.g. rent, melt, card
     – The control items for these were the CVCC sonority items (which had no letter names in them)
   • 6 CVC words that contained a CV letter name in the beginning
     – e.g. dean, peat
     – 6 controls for these with the same CVC structure, but containing no letter names, e.g. nail, boat
3. Distractors in order to have some words in which letter-phoneme relationships were not one-to-one:

Twenty words with complex letter-phoneme relationships (e.g. *rhythm*, *quench*)
Spelling segmentation: Scoring

1. Phonemic =  \(\text{G U L P}\)
2. C+V =  \(\text{G L U M}\)
3. V+C =  \(\text{G U L P}\)
4. Onset + Rime =  \(\text{G U L P} ; \text{G L U M}\)
5. Cluster =  \(\text{G L U M} ; \text{G U L P}\)
6. CV letter-name =  \(\text{B E A T}\)
Vowel + Consonant responses

Position by Sonority interaction

CVC
e.g. crib

CVCC
e.g. malt

/r/
/l/
nasal
obstruent

n.s.

*
Cluster responses

Position and Sonority main effects

<table>
<thead>
<tr>
<th></th>
<th>/r/</th>
<th>/l/</th>
<th>nasal</th>
<th>obstruent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCVC</td>
<td></td>
<td></td>
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<td>crib</td>
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<td></td>
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<tr>
<td>CVCC</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>malt</td>
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</table>
VC letter-name responses
Letter-name and Sonority main effects

Letter-name
e.g. belt

Control
e.g. malt
Spelling segmentation - Summary

• In some conditions as many as 25% of responses circled multiple phonemes
• Systematic effects of sonority
  – Sonorant consonants (/l/, /r/) were significantly more often grouped together with vowels than obstruents (e.g. bulk)
  – Obstruent consonants were significantly more often grouped together with consonants than sonorants (e.g. dusk)
• No sonority effects for words that had initial consonant clusters (e.g. stab) ➔ Onset effects

• Participants were significantly more likely to group together vowels and consonants if they together formed a VC letter name (e.g. bark vs. malt)

• No effect of CV letter names
Conclusions

1. Adults’ understanding of sound-letter relationships is influenced by the phonological properties of sounds

2. Use of large chunks fits in with spelling models
   – Suggests they may have a phonological basis

3. Exclusive use of phonemic segments is not necessarily the hallmark of advanced reading skills

4. Implications for teacher training
Next Steps

- Looking at adult readers of variable ability
- Looking at how children’s use of chunks develops with improving reading and spelling skills