The aim of this study was to examine the contribution and the nature of phonological representations involved during silent reading in French fifth graders.

Background

To date, a few information on phonological contribution during familiar word recognition in young readers is available. Two visual masked priming studies displayed opposed results

- Booth, Perfetti, and MacWhinney’s (1999) study using backward masked paradigm revealed a quick and automatic activation of phonology during naming task in Grades 2, 4 and 6.
- By contrast, Davis, Castles, and Lakovids (1998) failed to evidence an activation of phonological information in the lexical decision task in Grade 4 in their visual masked pseudohomophone priming experiment.

- Given these results and to ensure a phonological preactivation, we performed a cross-modal fragment priming experiment (auditory prime followed by visual target) associated with a go/no-go task in Grade 5 (Experiment 1).

Furthermore, there is a lack of evidence on nature of phonological representations involved in visual word recognition in children

- In models of silent reading (Grainger & Holcomb, 2009; Grainger, Léot, Bertrand, Duflou & Ziegler, 2012), it is generally admitted that the smallest segment involved in silent reading corresponds to the phoneme as it corresponds to letters (Coltheart, Curtis, Atkins & Haller, 1993).
- However, Lukatela, Eaton, Lee, and Turvey’s (2001) study suggested that visual word recognition involves typical phonological representations of spoken language namely subphonemic features (i.e., place of articulation, manner of articulation and voicing) in adults.
- In order to decide between these propositions, we used priming in number of subphonemic features shared with the target word.

In Hypothesis, we verified whether the relevant phonological format in speech processing was subphonemic feature in an auditory priming experiment in Grade 5 (Experiment 2).

Method

Participants: 43 (Experiment 1) and 44 (Experiment 2) children of Grade 5

Material: Targets were 39 words, 39 pseudowords and 188 fillers; only 16% of prime-target pairs were related

Phonemes can be characterized by three subphonemic features as place of articulation (specifics where in the vocal tract the constriction is), manner of articulation (specifics how narrow the constriction is) and voicing (specifics whether the vocal folds are vibrating).

4 types of auditory fragment primes (pseudowords) were used:
- In “Identical” condition (ID), the prime shared the onset of the target (e.g., /bRə/-BREBIS; ‘ewe’).
- In “Close-Variation” condition (CV), the fragment prime was close to the onset of the target, the first phoneme was different by one subphonemic feature (e.g., /dRə/-BREBIS).
- In “Distant-Variation” condition (DV), first phoneme was different by more than one subphonemic feature (e.g., /dRə/-BREBIS).
- In “Unrelated” condition (UR), all phonemes were different to those of the onset of the target (e.g., /stạ/-BREBIS).

Procedure: A cross modal and auditory priming procedures were used.
- Auditory Prime (mean duration: 300 ms)
- Inter Stimuli Interval (short: 50 ms)
- Auditory Target (mean duration: 486 ms)
- go/no-go task

Results

Cross modal priming in Grade 5 (Experiment 1)

The ANOVA revealed a main effect of condition on latencies by participants (F(3,126) = 4.04, p = .009, η² = .09) and by items (F(3,114) = 2.99, p = .034, η² = .07).

Planned comparisons revealed:
- Visual word recognition benefited from ID condition as compared to CV and DV conditions considered together (F(1,42) = 10.40, p = .002, η² = .20; F(1,38) = 6.87, p = .012, η² = .15).
- no difference between the CV and DV conditions (F(1,42) = 0.48, p = .49; F(1,38) = 1.69, p = .20).

Auditory priming in Grade 5 (Experiment 2)

The ANOVA revealed a main effect of condition on latencies by participants (F(3,129) = 3.31, p = .022, η² = .07; F(3,105) = 2.68, p = .05).

Planned comparisons revealed:
- Auditory word recognition benefited from ID condition as compared to CV and DV conditions considered together (F(1,43) = 8.86, p = .005, η² = .17).
- F(1,35) = 4.85, p = .034, η² = .12.
- no difference between the CV and DV conditions (F(1,43) = 0.14, p = .71; F(1,35) = 0.71, p = .41).

Discussion

First, the main result was the facilitation effect observed when spoken fragment and written word shared the first phonemes compared to an unrelated condition. This result suggests that familiar word recognition process engaged sublexical spoken phonological representations in automatic manner and that visual word recognition system is intimately connected to the system of speech processing.

Second, results showed that written word processing was sensible to whole phoneme. These results suggest that written processing uses phonemic unit probably because letter corresponds precisely to a phoneme.

Third, surprisingly speech processing was also sensible to phoneme. This ultimate result differs with result obtained in Sauval, Casalis & Perre’s (2013) study in which speech processing extracted subphonemic features in Grade 2. This difference between Grade 5 and Grade 2 could be interpret in two ways: 1) growth of vocabulary or 2) learning to read may modify sublexical phonological representations.

References


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