



# Réseau canadien de recherche sur le langage et l'alphabétisation CANADIAN LANGUAGE & LITERACY RESEARCH NETWORK



Presented at the Annual Network Conference  
June 16-19 2004,  
Montreal, QC

## Age Changes in the missing-letter effect Revisited Jean Saint-Aubin<sup>1</sup> and Raymond M. Klein<sup>2</sup>



### Abstract

When asked to detect target letters while reading, subjects miss more letters in frequent function words than in less frequent content words. This phenomenon, known as the missing-letter effect, is thought to reflect the cognitive processes involved in reading. The study is aimed at investigating the developmental changes in component language and literacy skills highlighted by the increasing size of the missing-letter effect with age. With adults, it has been shown that the missing-letter effect is due to both word function and word frequency. With children, it is unclear if the growing size of the missing-letter effect is due to a larger effect of word function, word frequency or both across development. Results of two experiments revealed that the influence of word function increases with age, while the effect of frequency is fairly stable across ages. Furthermore, normative data collected in Experiment 2, revealed that third graders and undergraduate students were equally good at predicting function slots in a sentence. This was interpreted as suggesting that although younger readers could take advantage of contextual constraints to develop an on-line representation of the text structure while reading, they do not seem to perform it while reading.

### Background on the Missing-letter

The size of the missing-letter increases with age: The difference between omission rate for the frequent function word and less frequent content words is greater for older than for younger children in primary schools (see, e.g., Cunningham et al., 1988; Drewnowski, 1978).

With adults it is well known that both word frequency and word function contribute to the missing-letter effect. However, in development, the missing-letter effect has been assessed by contrasting a highly frequent function word with less frequent content words. Consequently, the reason for this developmental trend is unclear. On one hand, it could be due to the fact that both factors highlight the same reading process or that they highlight distinct processes developing at the same pace. On the other hand, the growing size of the missing-letter effect with grade level could reflect the fact that frequency and word function are linked to distinct processes developing at different pace. In early stages, only one of the two processes might be operative. The later addition of the second process would translate into a larger missing-letter effect.

This test was implemented by isolating the influence of word frequency and word function.

### Method [Experiment 1]

**Subjects:** 160 children in grade 1, 2, 3, 4, 7 and 24 undergraduate students.

**Materials:** 3 texts were used for the letter detection task

**Des [indefinite article] vs. 3 letter control content words**

The basic missing-letter effect [frequency + word class confounded]

**Faire [to do] vs. Laver [to wash]**

Same role different frequency: *Faire is the most frequent*

**Avec [with] vs. Aller [to go]**

Same frequency, but different word class

### Method [Experiment 2]

**Subjects:** 91 children in grade 3 and 195 adults.

**Materials:** The same three texts as used in Experiment 1.

**Procedure:** 4 words were presented on a screen and subjects were required to write the 5th one. They received feedback about the accuracy of their response and the actual word belonging to the text was presented.

For adults, a web based version of this procedure was used, while for third graders, testing was carried out in group, in five classrooms.

Two performance measures were computed:

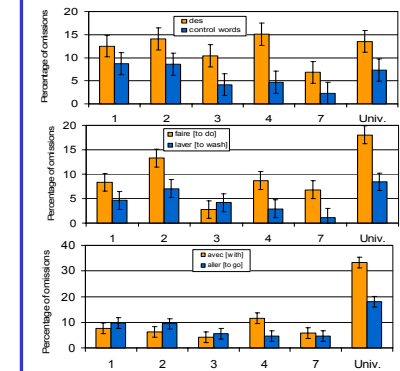
**Hit Rate** which is the proportion of subjects correctly guessing the item.

**Proportion function word** which is the proportion of subjects guessing a function word, be it the target word or not.

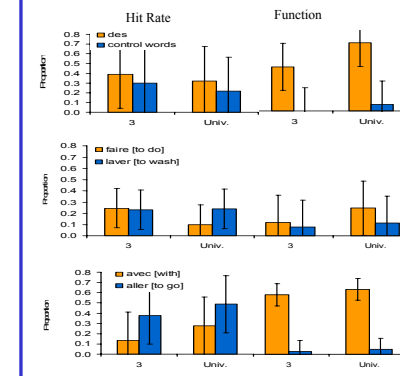
### Discussion

1. Among younger readers, the missing-letter is entirely due to word frequency, even first graders show it as long as they are good readers.
2. By the end of grade 4, word function effects are appearing.
3. The failure to find a word function effect among younger readers is unlikely to be due to the inability of younger readers to use contextual constraints to predict sentential slots in which function words are likely to reside, because they are just as accurate as undergraduate students in predicting word class of forthcoming words.
4. Instead, the failure to find a word function effect among younger readers can be seen as supporting the view that even when instructed to read for comprehension, for younger readers the processes of word decoding is using all their resources.

### Results [Experiment 1]



### Results [Experiment 2]



**NOTE:** On all figures, error bars represent confidence intervals, at  $\alpha = .05$ , computed according to the method of Loftus and Masson (1994) for the target word effect.



1  
2

### The Missing-Letter Effect

Text after subject as read it.

When the foreman came in, he seemed very surprised by my appearance. He showed me the cloakroom, and gave me my uniform, and a tag showing my name. Probably because I was afraid of seeing the shop, I was very glad when a worker welcomed me. It was very noisy, and especially so as we received the load of iron. We used a ton of iron bars daily for producing tin cans. I was surprised by the number of phases an iron bar came through before becoming a nice and clean tin can.

Text with the correction grid over it.

