



# The word length effect in virtual hemianopia, real hemianopia, and alexia

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## INTRODUCTION:

- Word-length effect = time taken to read a word correlates with numbers of letters
- Perceptual rather than linguistic variable
- A hallmark of **pure alexia**
- Most of these subjects also have right hemianopia
- Right hemianopia *per se* slows reading

**QUESTION:** How much of a word-length effect can be caused by hemianopia alone?

Definitive conclusions are difficult to obtain from hemianopic patients:  
How can you be certain that extrastriate damage is not compounding effects?

## STRATEGY:

Study virtual hemianopia in healthy subjects with a gaze-contingent technique

## METHOD:

13 adult subjects

EyeLink 1000 (1000 samples/sec)  
NEC Multisync monitor (140Hz refresh)  
maximum lag time of 7.1ms.

Display – 140 words of 3-9 letters of similar Kucera-Francis frequency  
Size: 1 letter occupies 1.5° space  
1 word shown at a time

Read word aloud:  
Analyze - verbal onset latency  
- number of fixations

3 viewing conditions:

- full field
- complete right hemianopia
- complete left hemianopia

## RESULTS:

### 1. WORD-LENGTH EFFECTS:

#### MEANS

full field – 14.2 ms/letter  
right hemianopia – 37.7 ms/letter  
left hemianopia – 31.4 ms/letter

ANOVA – hemianopias > full field  
Right hemianopia ≈ left hemianopia

#### 95% PREDICTION INTERVALS:

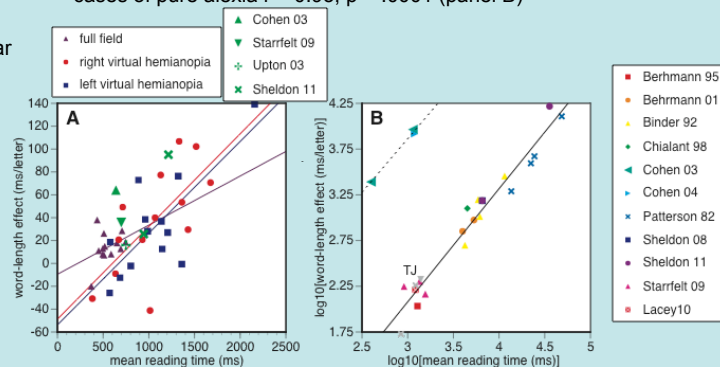
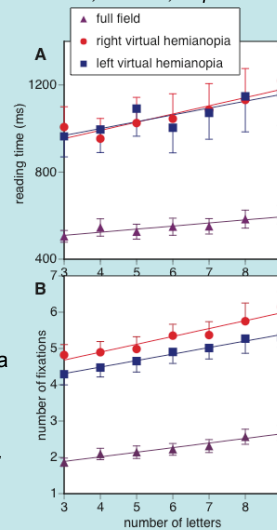
full field = 51ms/letter  
right hemianopia = 161 ms/letter

### 2. WORD-LENGTH EFFECT VS MEAN READING TIME:

#### CORRELATIONS (panel A):

full field  $r = .36$ ,  $p = .20$   
right hemianopia  $r = .68$ ,  $p < .008$   
left hemianopia  $r = .77$ ,  $p < .002$

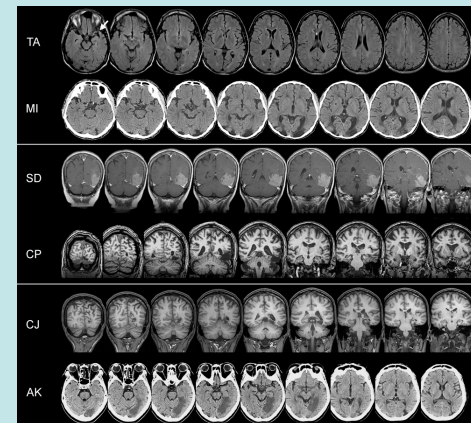
From reports in the literature, a similar relationship is seen for cases of pure alexia  $r = 0.93$ ,  $p < .0001$  (panel B)



## APPLYING THESE CRITERIA TO REAL PATIENTS:

Six paradigmatic patients:

TA, MI = hemianopic dyslexia (without left fusiform lesions)  
SD, CP = pure alexia (with left fusiform lesions) **WITHOUT** hemianopia  
CJ, AK = pure alexia (with left fusiform lesions) **AND** hemianopia



	reading time	word-length effect
TA	945	25.7
MI	1215	95.1
SD	844	53.4
CP	1220	182
CJ	6570	1536
AK	35700	16500

## CONCLUSIONS:

- Hemianopia alone can create a moderate word-length effect
- Upper limit for the right hemianopia word-length effect = 161 ms/letter
- Need separate criteria for word-length effect indicating pure alexia:  
Without hemianopia: >51ms/letter  
With hemianopia: >161ms/letter
- Mean reading time highly correlated with word-length effect.
- Logically, this is not necessarily a given - in alexia with agraphia, a linguistic disorder, mean reading times are prolonged without a word length effect.
- Mean reading time may be a redundant variable in perceptual reading disorders.