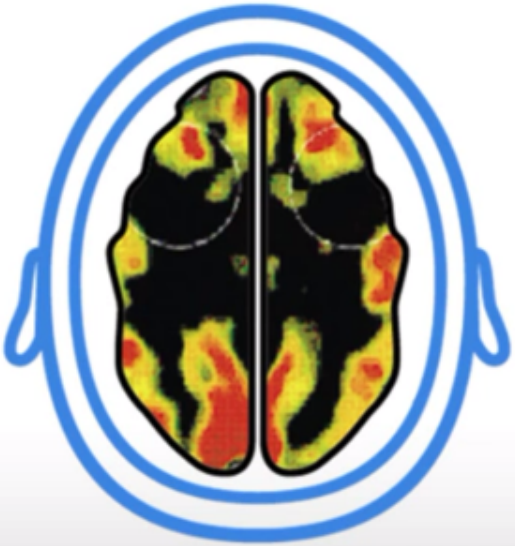
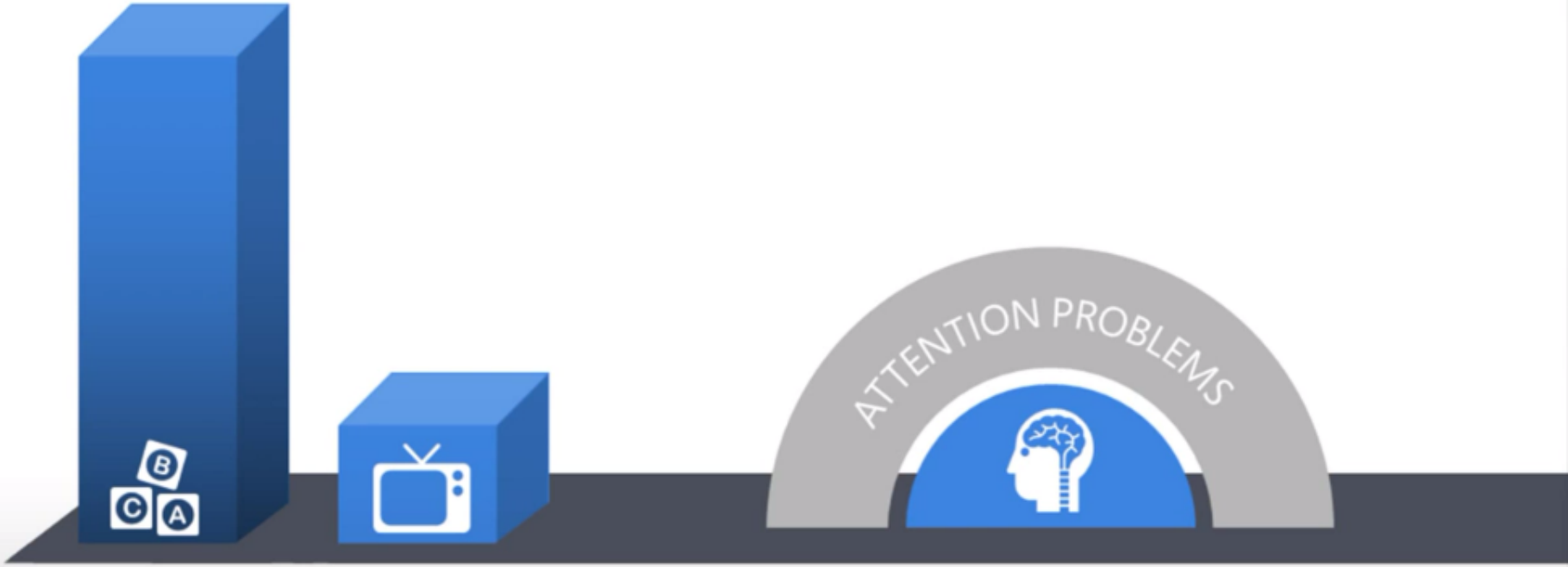
Too Little Stimulation Is Bad

Normal



Sensory-Deprived



MORE
Cognitive Stimulation

LESS likely to have
attention problems

AGE 3

MORE
Television

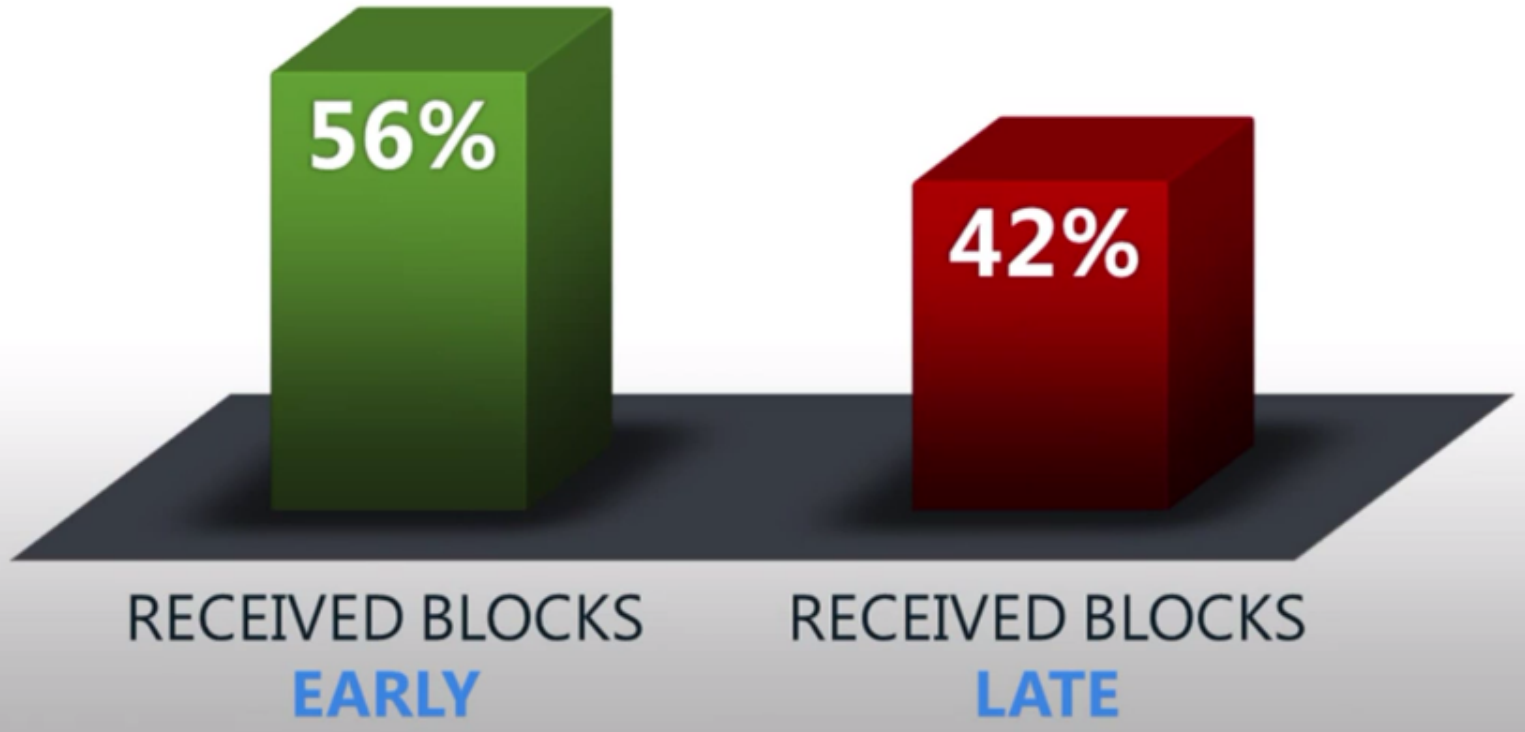
AGE 7

MORE likely to have
attention problems

BUILDING BLOCKS STUDY

- Randomized trial at Seattle clinic
- ~200 kids 18-24 months
- ½ got blocks at beginning;
  ½ got blocks at end
- Parents got "Bloctivities"
  - Sort blocks, stack blocks,
    count blocks

Language percentiles after 6 months



Virtual Teachers

- Upside
  - Available 24/7
  - Can be Engaging

Virtual Teachers

- Upside
  - Available 24/7
  - Can be Engaging
- Downside
  - Expensive Programs
  - Require Maintenance
  - No Personal Interaction
  - Not always Effective
  - Need Huge Time on Task

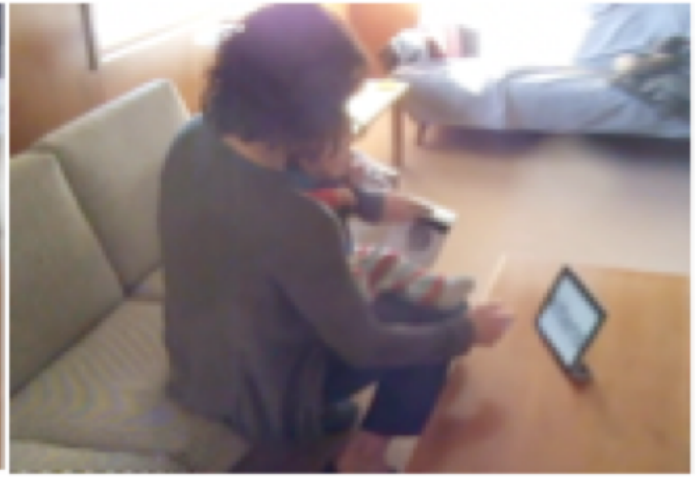
Learning Efficiency

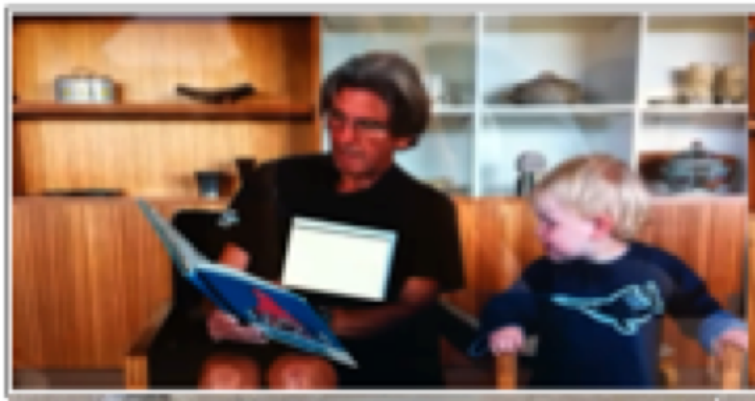
- 5 hard-of-hearing students (8-10 yrs. old)
  - 45 words, about 2.5 hours
- 11 hard-of-hearing students (11-14 yrs. old)
  - 81 words, about 3.5 hours
- 8 hard-of-hearing students (6-10 yrs. old)
  - 24 words, about 9 hours across 10 weeks
- 8 autistic children (7-12 yrs. Old)
  - 49 words, about 7 hours across 6 months
- 6 autistic children (7-12 yrs. Old)
  - 18 words, about 3 hours across 3-8 weeks

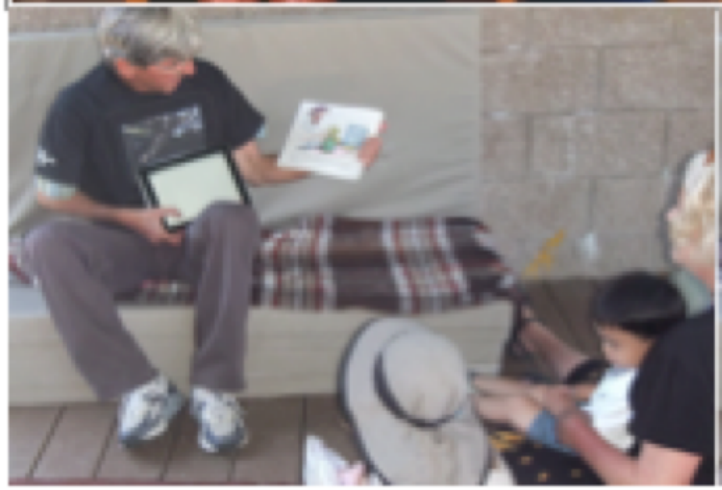
    - Note that the longer times required for the last three studies include additional time for testing in the multiple baseline design.

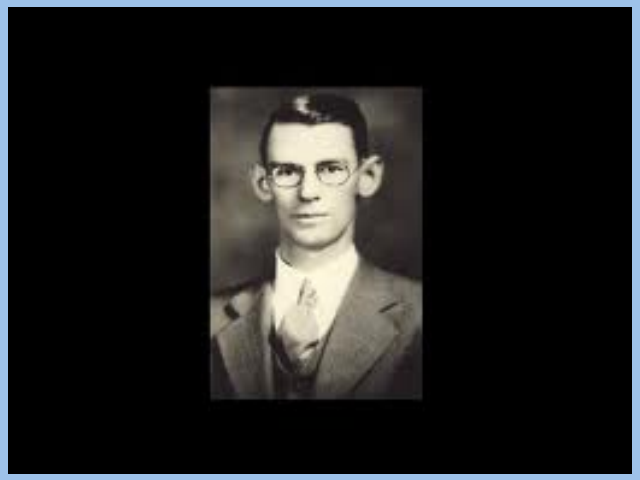
Read With

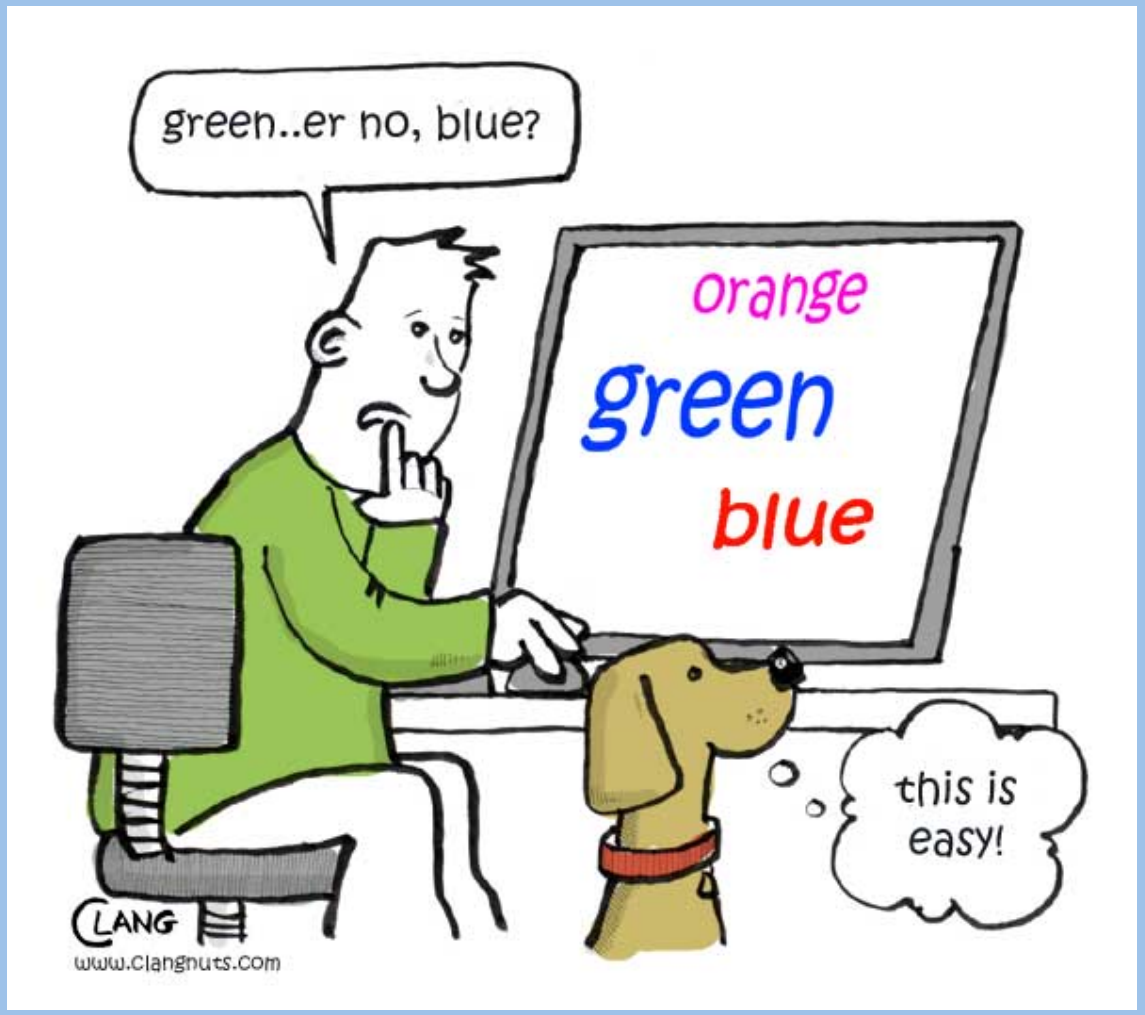
Me







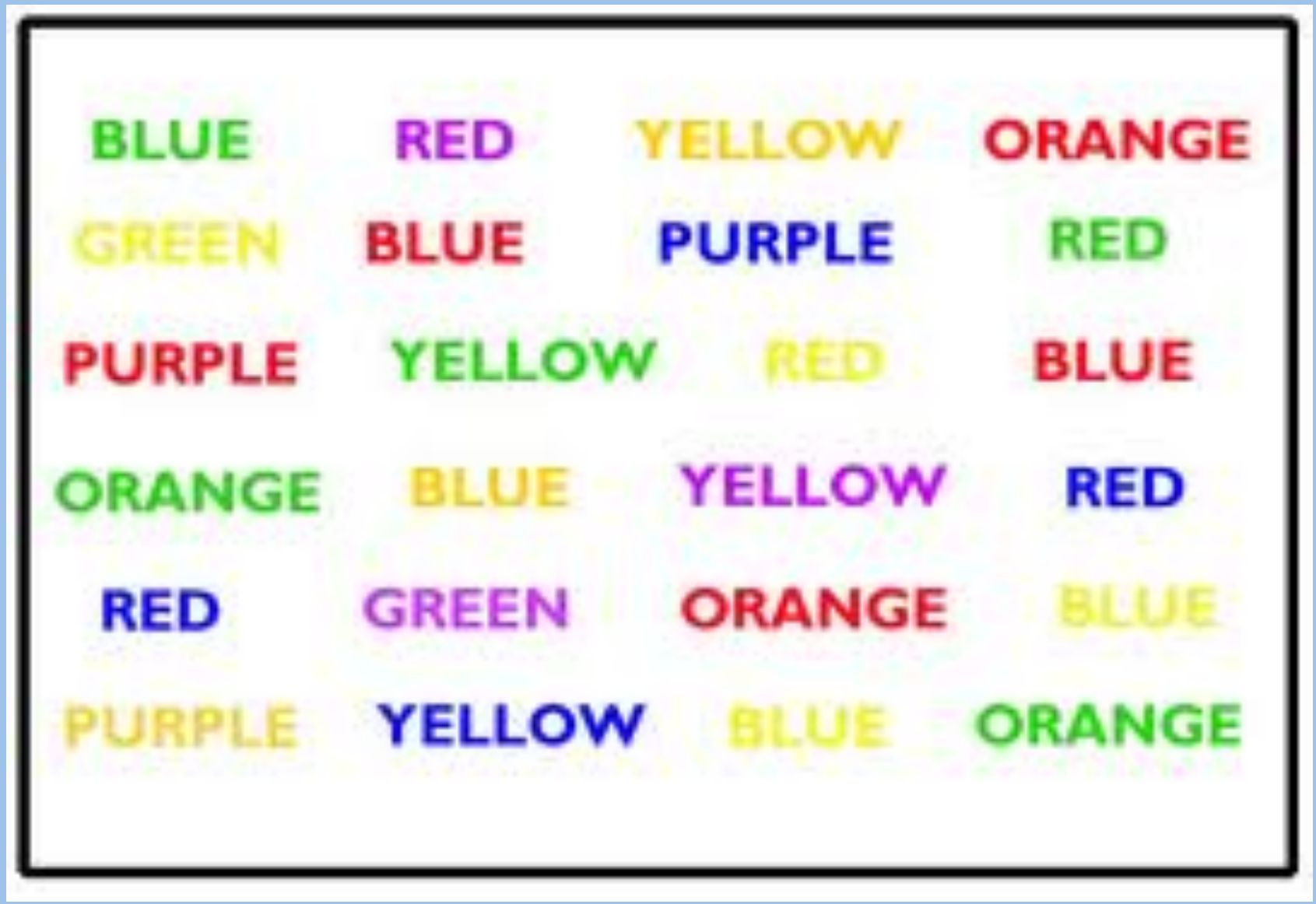




http://www.youtube.com/watch?v=Tpge6c3Ic4g

Edmund Huey wrote in 1908:

to completely analyze what we do when we read would almost be the acme of a psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind, as well as to unravel the tangled story of the most remarkable specific performance that civilization has learned in all its history.


BLUE RED YELLOW ORANGE
GREEN BLUE PURPLE RED
PURPLE YELLOW RED BLUE
ORANGE BLUE YELLOW RED
RED GREEN ORANGE BLUE
PURPLE YELLOW BLUE ORANGE

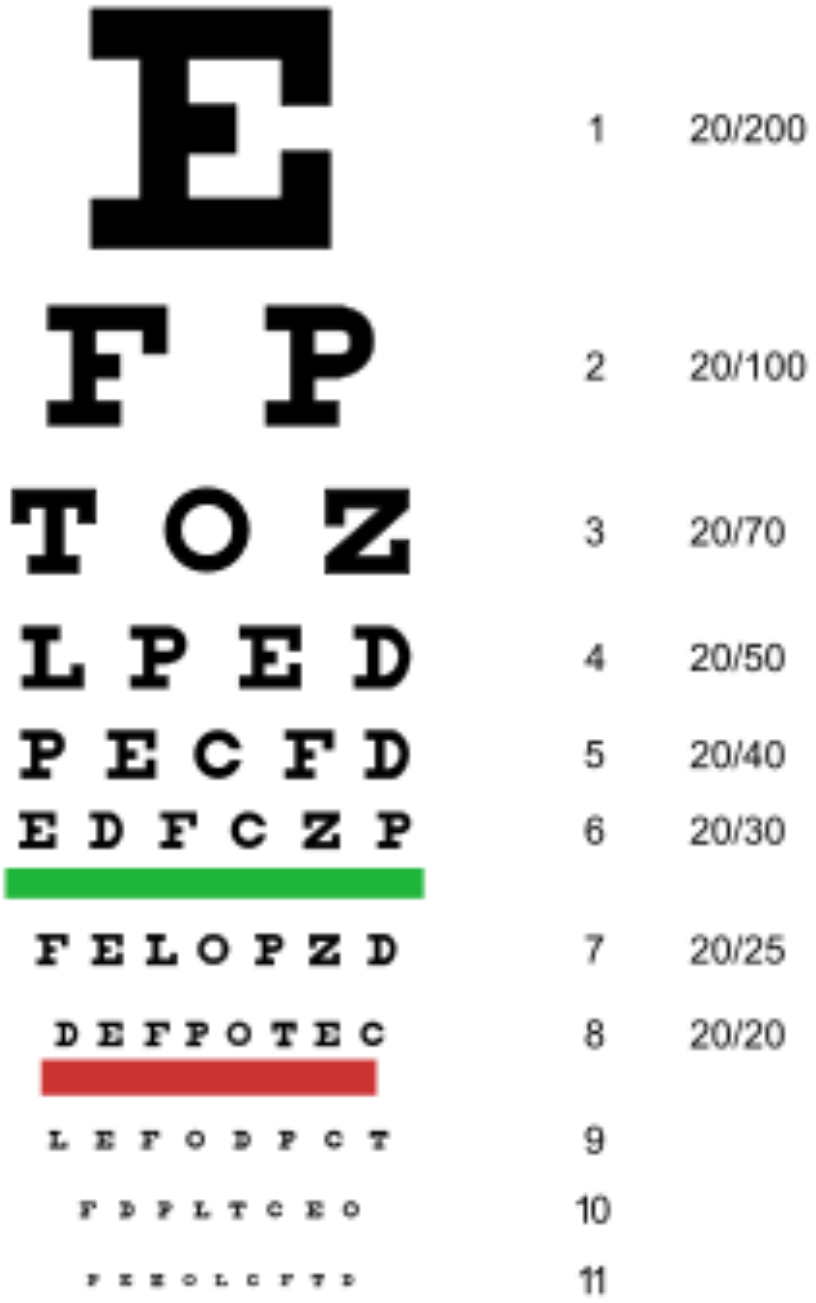
Aoccdrnig to a rscheeahcr at an Elingsh uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht the frist and lsat ltteer are in the rghit pclae. The rset can be a toatl mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae we do not raed ervey lteter by itslef but the wrod as a wlohe.

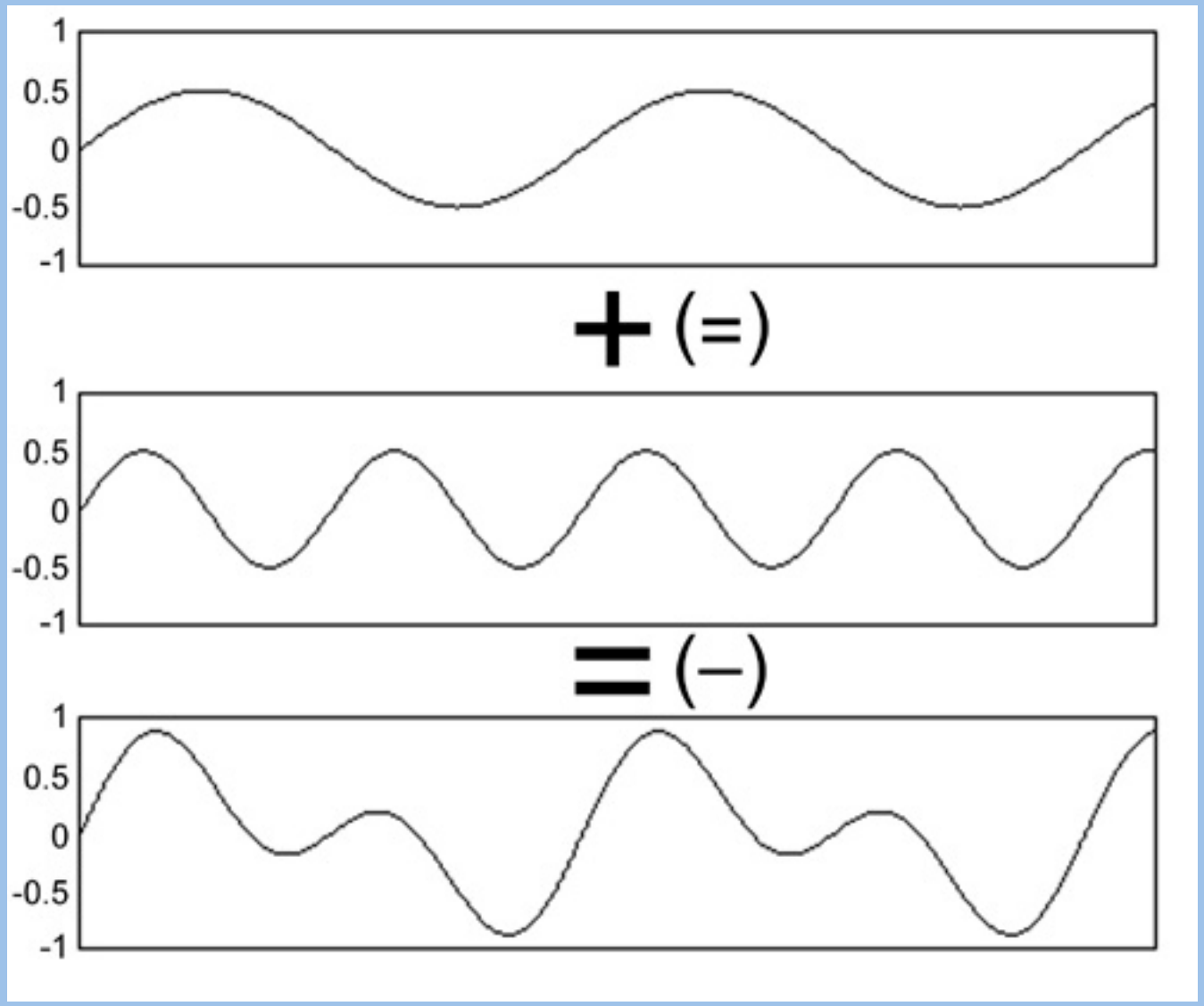
Empirical Tests

- We analyzed 1000 most frequent words in English
- 9% are uniquely defined by their exterior letters
- Adding word length increased this percentage to 40%
- 24% of the words have a unique word shape
- When exterior letters, interior word shape and length were considered as features, 75% are uniquely described..
- However, this requires the reader to recognize the first and last letters, the length of the word, and the word shape of the interior letters.
- This is not a trivial amount of processing to bypass a strategy simply of processing the letters of the word.

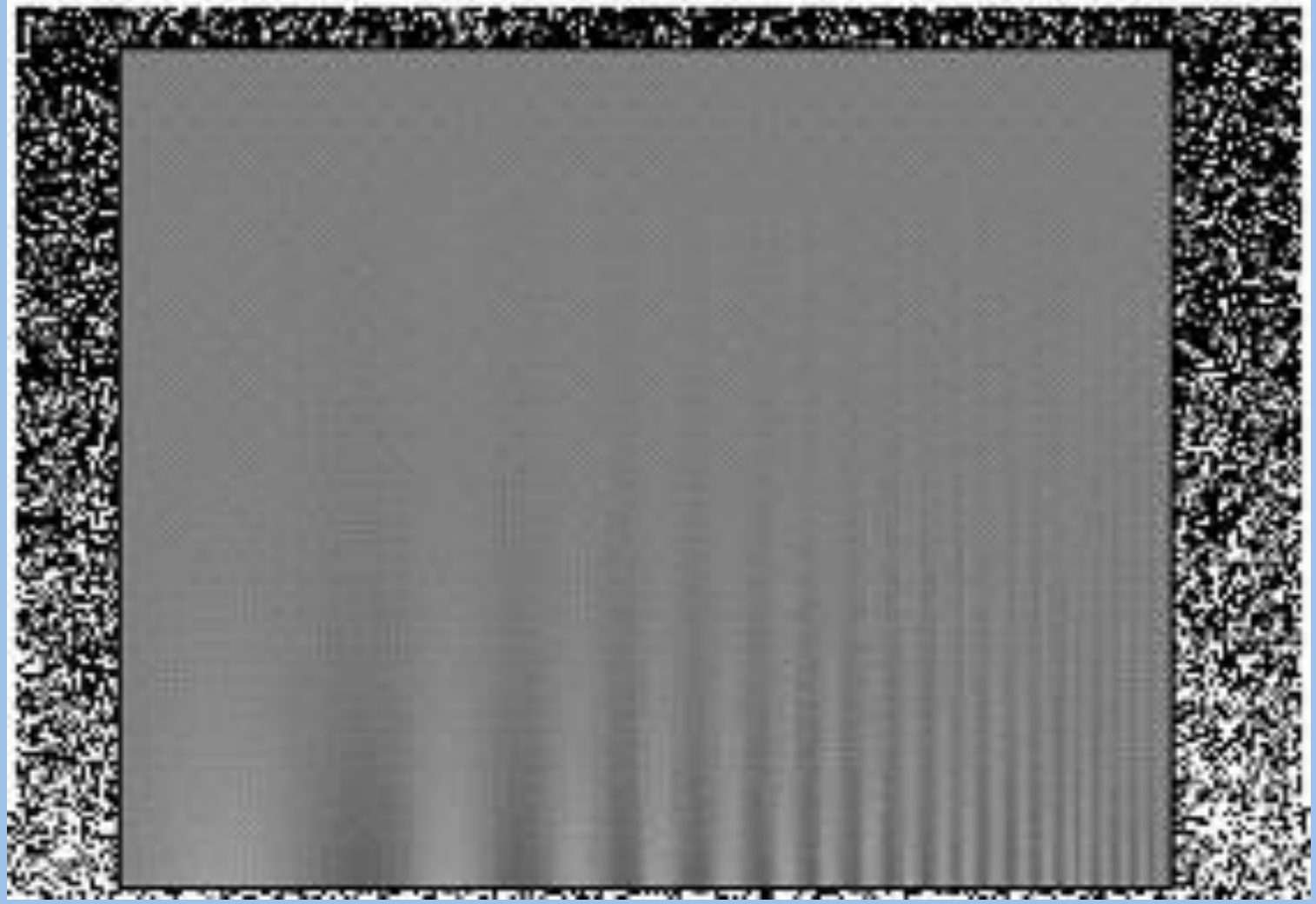
Two Important Influences

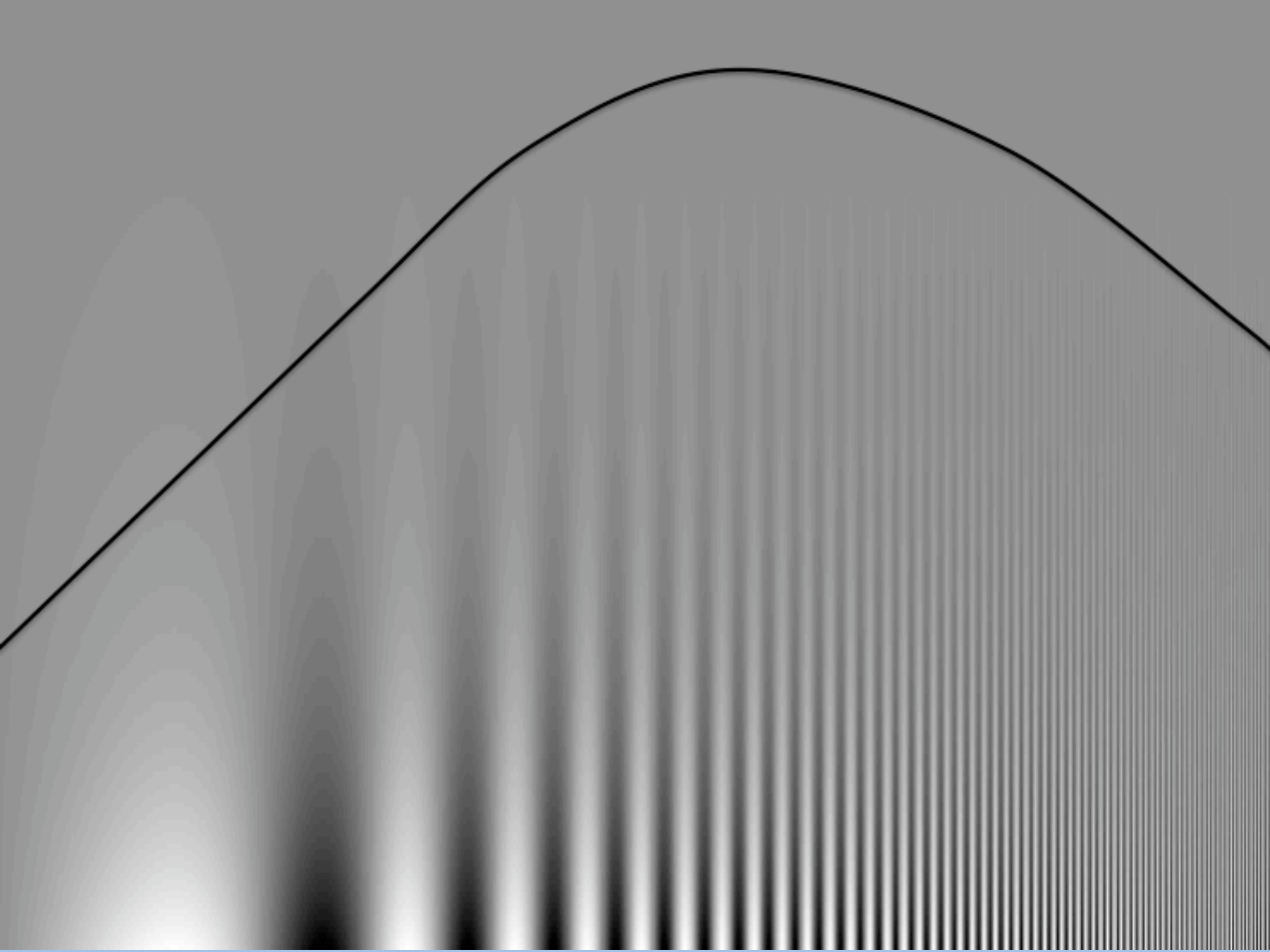
- Bottom Up Visual Processing
- Top Down Knowledge Processing

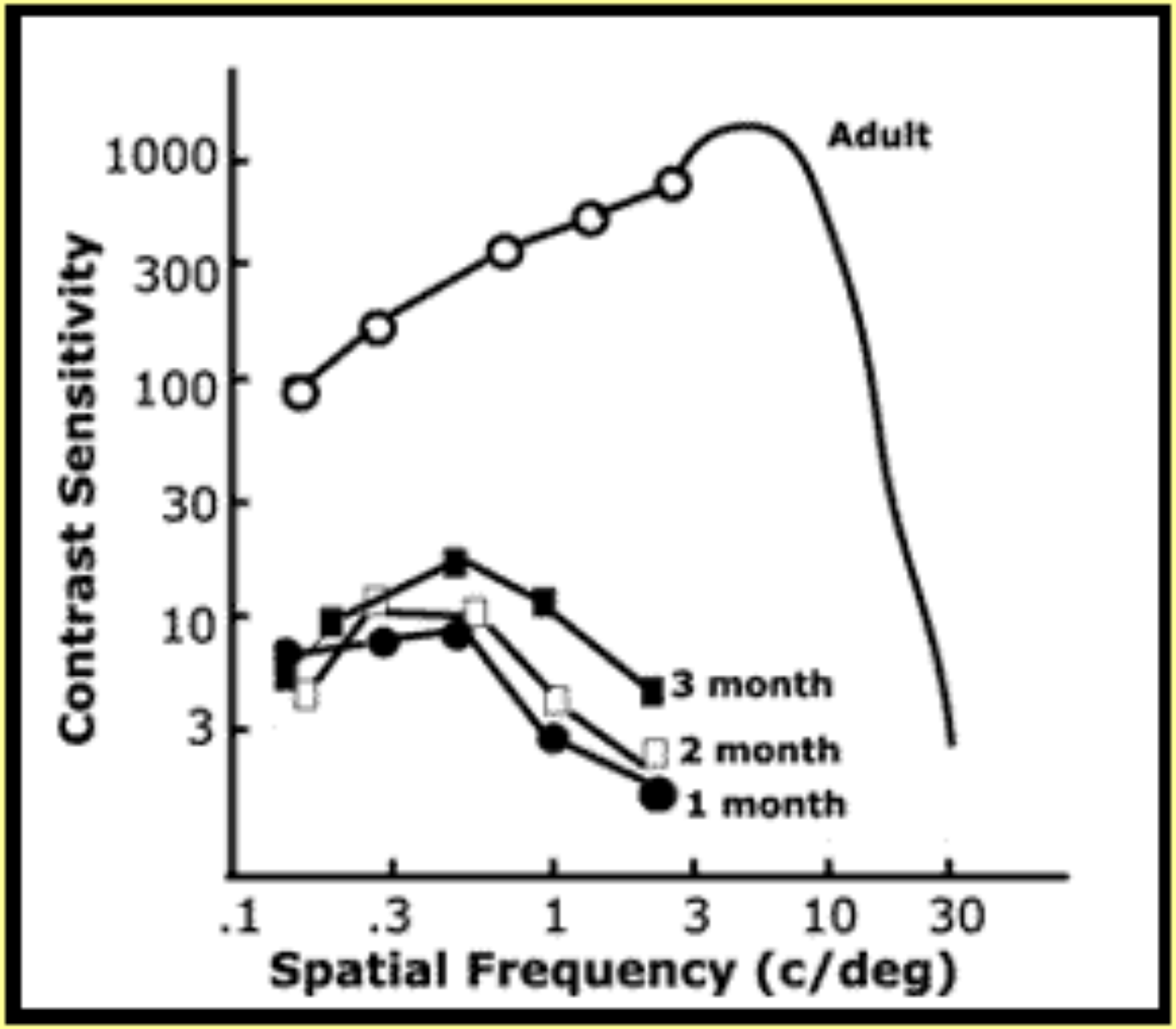

E
1 20/200
F P
2 20/100
T O Z
3 20/70
L P E D
4 20/50
P E C F D
5 20/40
E D F C Z P
6 20/30
F E L O P Z D
7 20/25
D E F P O T E C
8 20/20
L E F O D P C T
9
F D P L T C E O
10
11


1
0.5
0
-0.5
-1
+ (=)
1
0.5
0
-0.5
-1
= (–)
1
0.5
0
-0.5
-1

Contrast Sensitivity






Adult
1000
300
100
30
10
3
Contrast Sensitivity
3 month
2 month
1 month
.1
.3
1
3
10
30
Spatial Frequency (c/deg)

Adult

3 months

6 months

9 months

Infants Seeing Letters

- 3-month-olds discriminated and remembered the letters L and T
- Infants were trained to kick their leg to move a mobile composed of blocks that were decorated with the letter L
- They did not transfer this learning when they were subsequently tested with a mobile decorated with the letter T
- they could tell the difference between the two letters (see also Rovee-Collier, 1997).
- Adler, S. A., & Rovee-Collier, C. (1994). The memorability and discriminability of primitive perceptual units in infants. Vision Research, 34, 449-459.

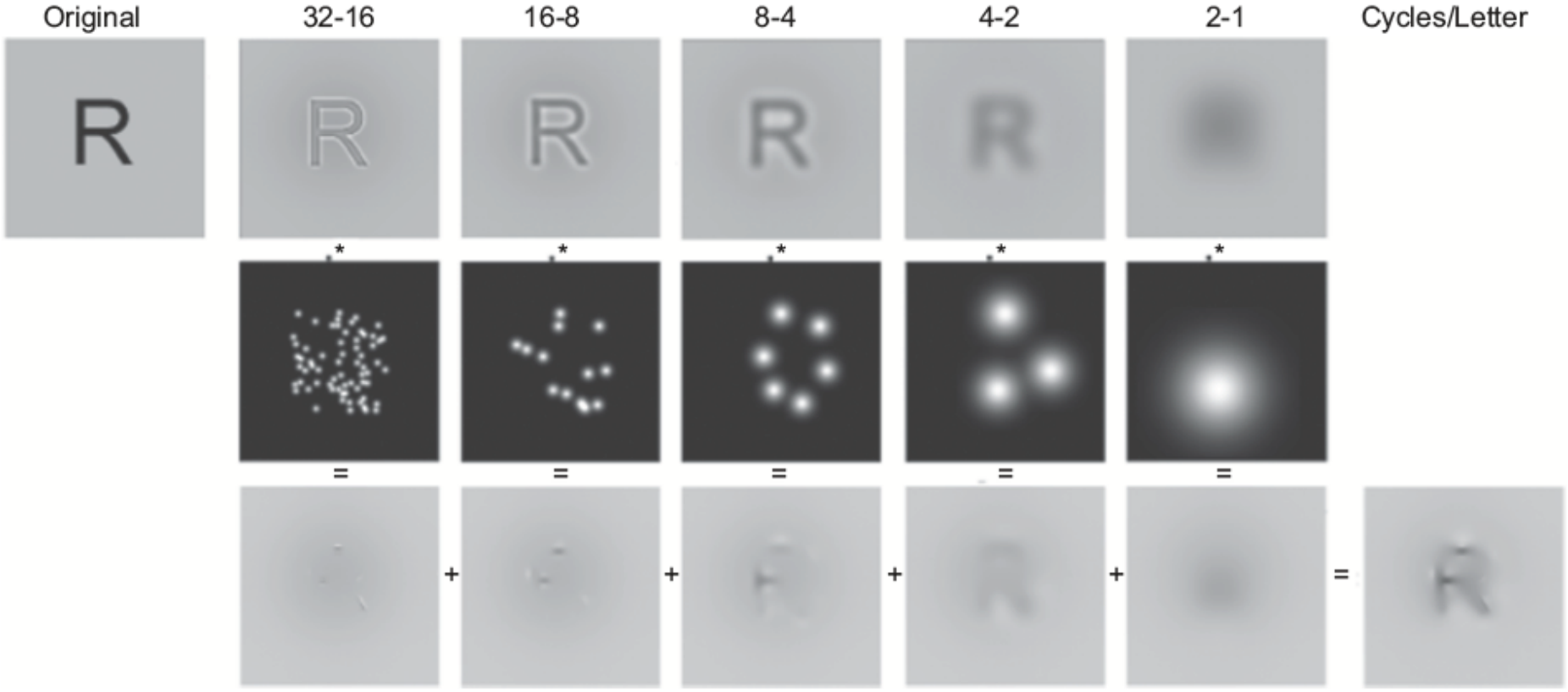


Fig. 1. Illustration of the stimulus-generation process. Each original letter (upper left) was first decomposed into five spatial-frequency bandwidths of one octave each (top row). Each bandwidth was then independently sampled with randomly positioned Gaussian windows (i.e., bubbles), so that sparse information was revealed (middle row). The information samples were summed across the five scales to produce an experimental stimulus (bottom row).

Features for Identification of Uppercase and Lowercase Letters
Daniel Fiset,1 Caroline Blais,2 CatherineE´ thier-Majcher,2 Martin Arguin,2
Daniel Bub,1 and Fre´de´ric Gosselin2

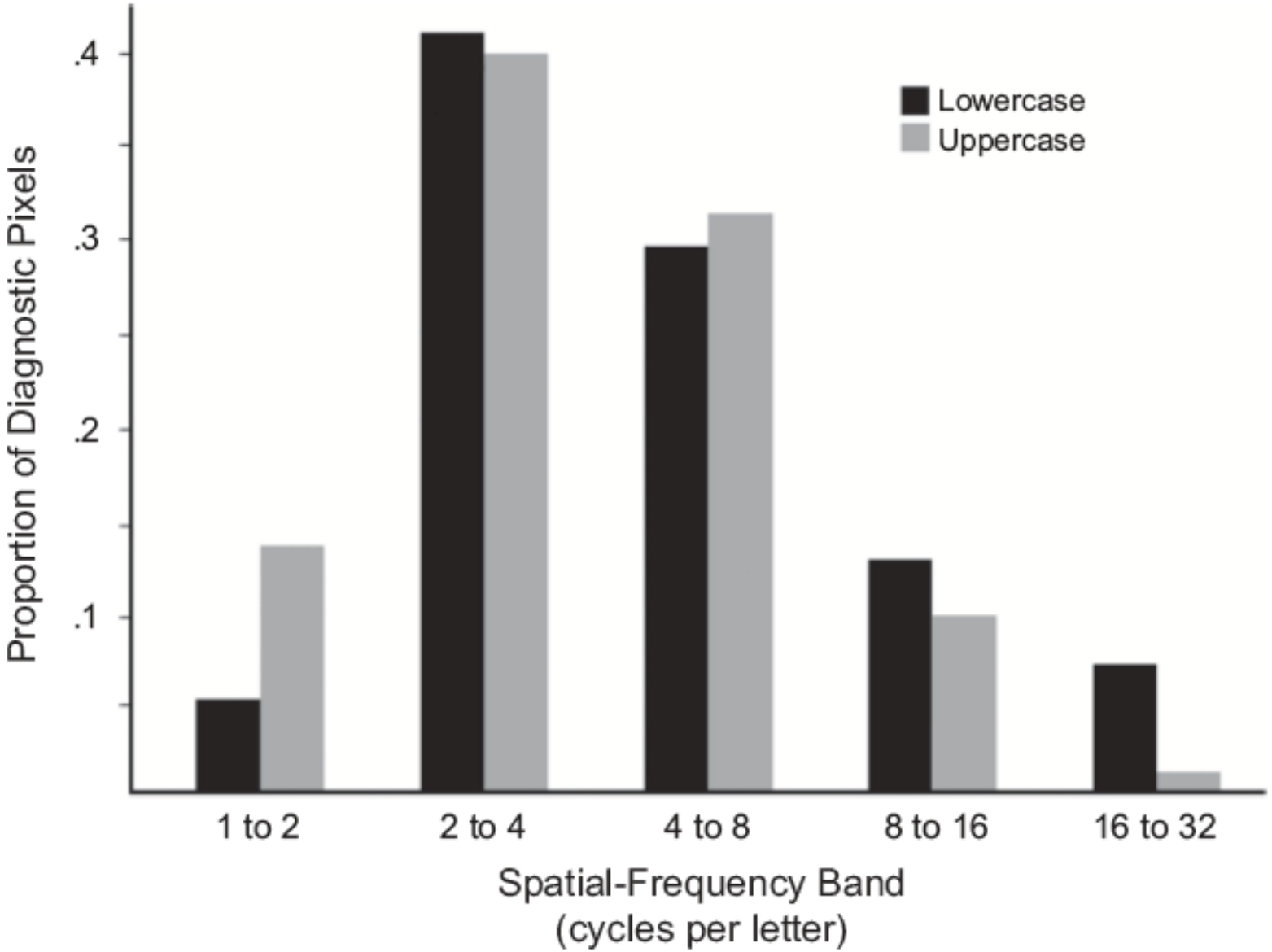


Fig. 4. Relative use of the five sampled spatial-frequency bandwidths for recognition of uppercase and lowercase Arial letters.

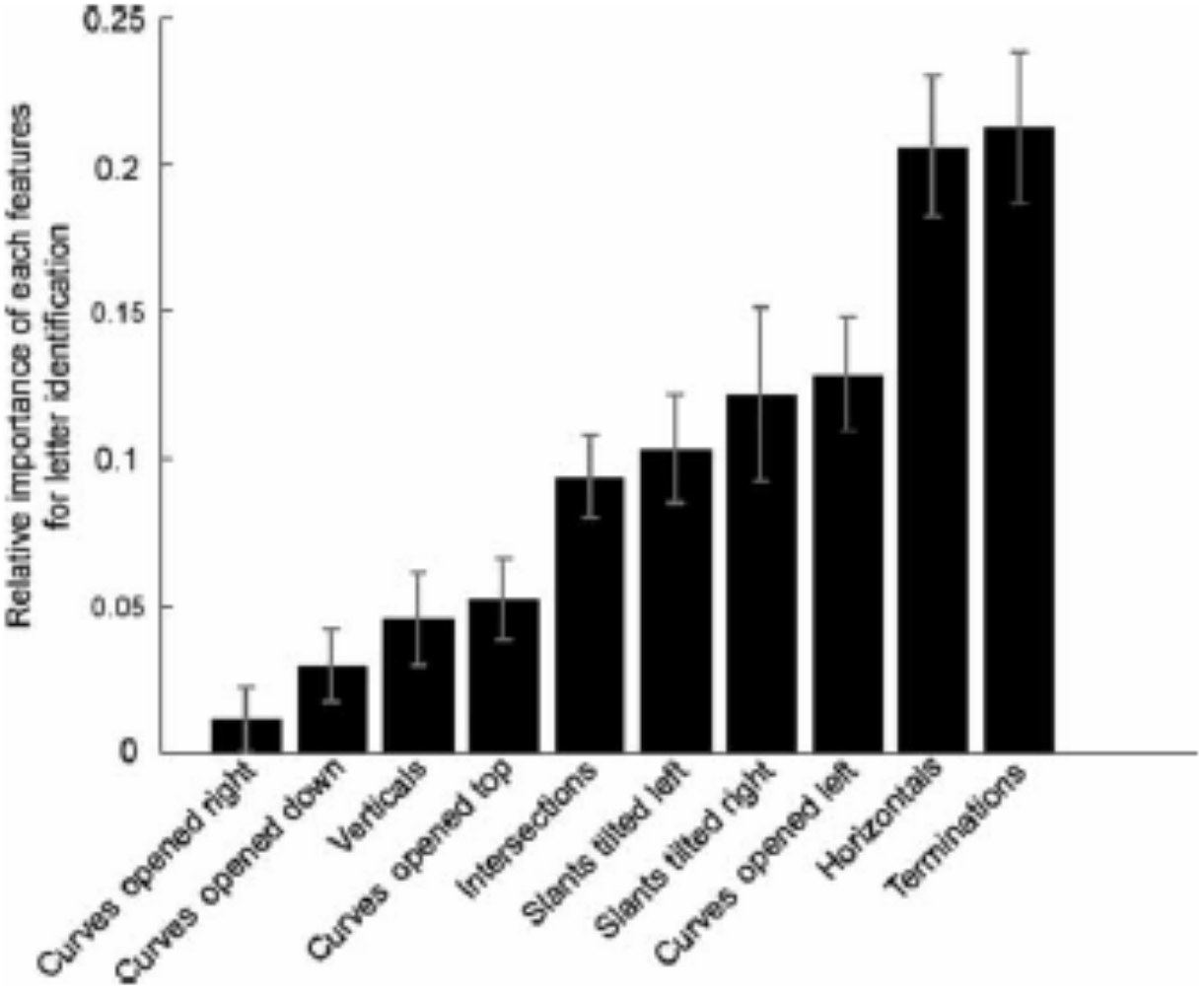


Figure 5. *Results of the overall a priori feature analysis, all letters and all frames confounded. Error bars indicate 95% confidence intervals. To view a colour version of this figure, please see the online issue of the Journal.*

Letter Information

- Groups of confusable letters
  - a s z x
  - e o c
  - n m u
  - r v w
  - d h k b
  - t i l f
  - g p j y q

Letter	Hit	False Alarm	d'	Confusions Greater than 5%
a	.372	.015	1.85	e(14), g (7)
b	.743	.020	2.72	
c	.449	.016	2.05	o(6), e(5)
d	.639	.011	2.64	
e	.365	.017	1.79	o(8), c(6), g(5)
f	.456	.020	1.94	i(14), l(8), t(7)
g	.703	.022	2.56	
h	.662	.020	2.46	n(5), b(5)
i	.277	.023	1.42	l(22), f(11), t(6), j(6)
j	.412	.017	1.92	l(7), i(6)
k	.655	.014	2.61	
l	.530	.022	2.10	i(10), k(5)
m	.628	.010	2.66	n(6)
n	.497	.013	2.24	h(15), r(8), m(5)
o	.331	.014	1.78	c(10), b(8), p(8), a(6)
p	.730	.016	2.78	
q	.649	.010	2.71	a(6)
r	.591	.023	2.24	t(8)
s	.324	.010	1.87	e(7), c(7), g(7), a(5)
t	.382	.020	1.76	f(12), r(12), i(9)
u	.554	.010	2.46	
v	.520	.015	2.16	y(13)
w	.632	.010	2.66	x(5)
x	.730	.010	2.94	
y	.686	.015	2.67	v(11)
z	.571	.010	2.51	x(7)

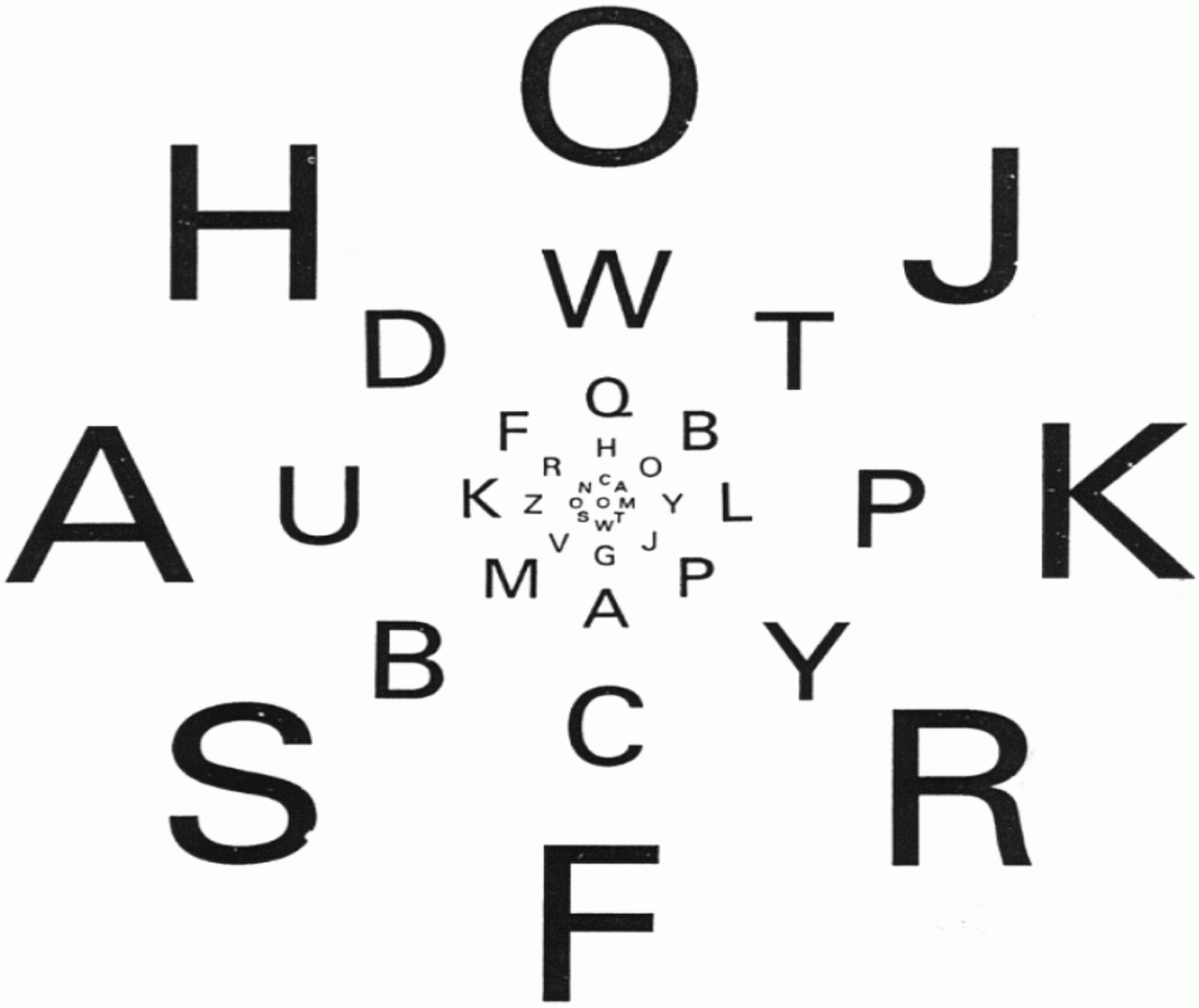


Figure 2.8.1 A chart demonstrating variations in acuity with retinal position. (From Anstis, 1974.)

Unfriendly Neighbors
Tunnel Vision

Xxxx xxxxx xxx xx xxxxx xxxx.

Ecec ecece cec ce ceccec ecececee.

Ijtji jitij itijt iti jtjt ijtitij itjitij ijt.
Now is the timexfor all good men.

Two Important Influences

- Bottom Up Visual Processing
- Top Down Knowledge Processing

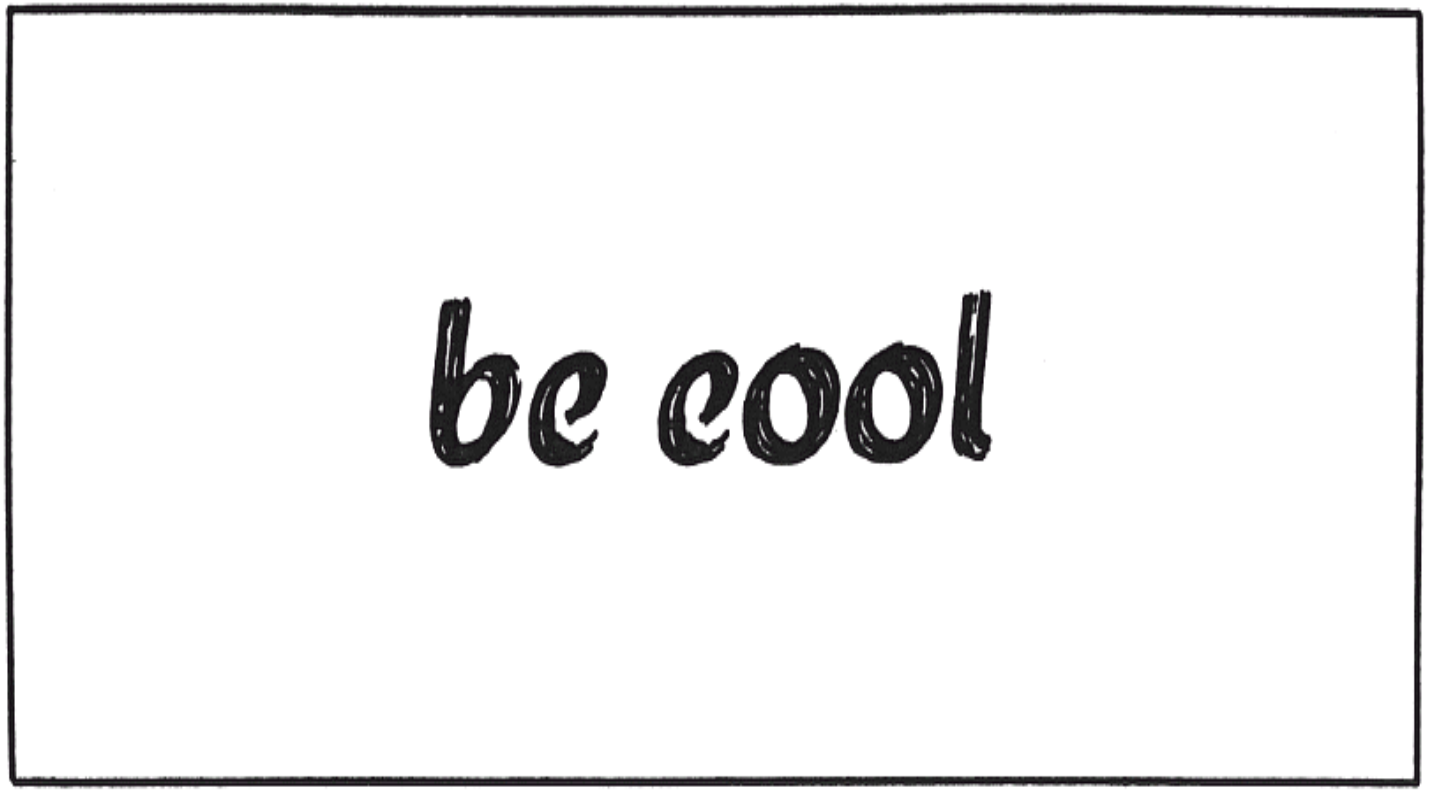


Figure 2. The same visual configuration can be interpreted as two different letters, depending on the meaningful context.

Word Superiority Effect:

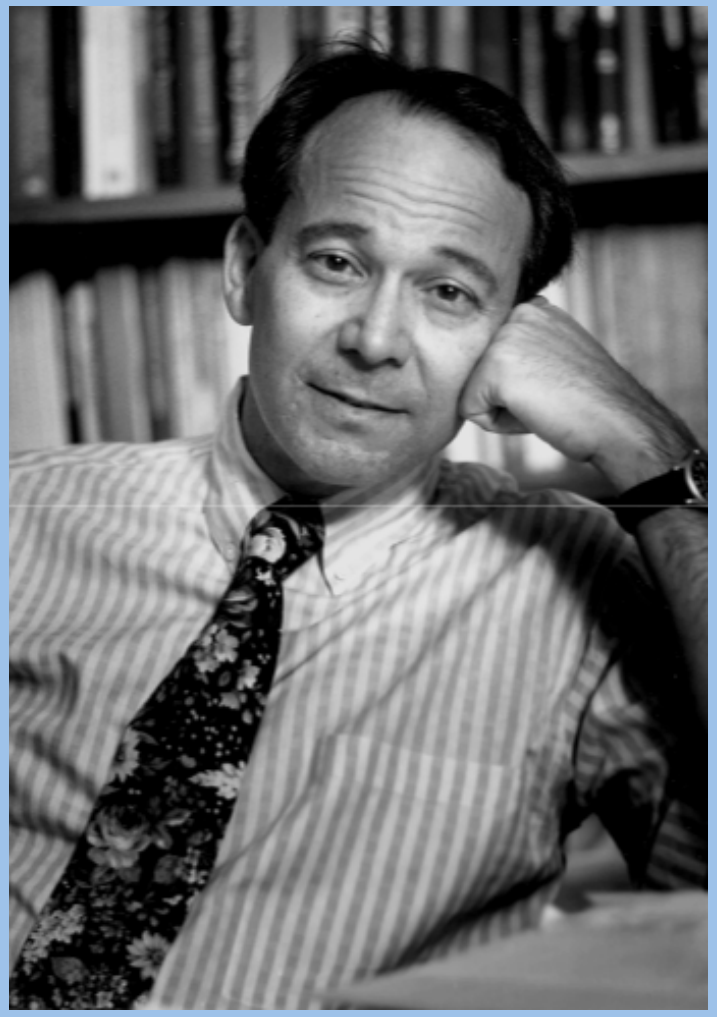
Letters better recognized in a word or pseudoword than a nonword.

Word Shape Doesn't Change Word Advantage:

Letters better recognized in a word or pseudoword than a nonword.

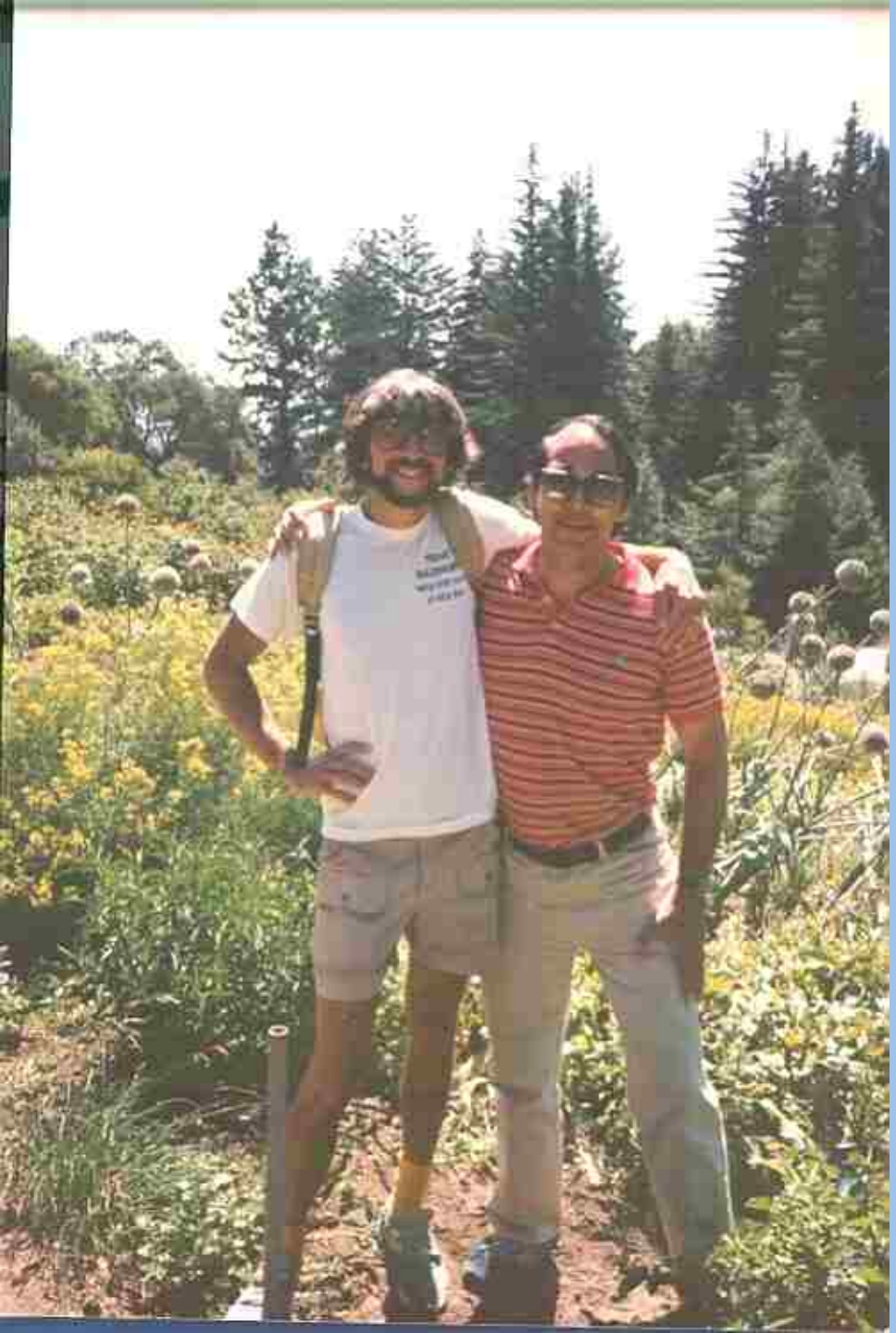
Word	Pseudoword	Nonword
rEAd	tHaP	yIbv
bACk	SuCE	gTsI
wEak	BleT	MbIa

Marilyn Adams, 1979



Quantifying Experience
Now Big Data

Richard L. Venezky 1970.
The structure of English orthography.
The Hague: Mouton & Co.



Dick Venezky and I (Venezky & Massaro, 1979, p. 87) observed that phonics instruction "draws attention to the orthographically regular features of printed words"

Two Types of Constraints

- Orthographic Structure
  - Rule-Based Structure
  - Frequency of Occurrence
- Sound/Spelling Correspondences
  - Spelling-to-Sound Regularity
  - Sound-to-Spelling Regularity

Two Types of Orthographic Structure

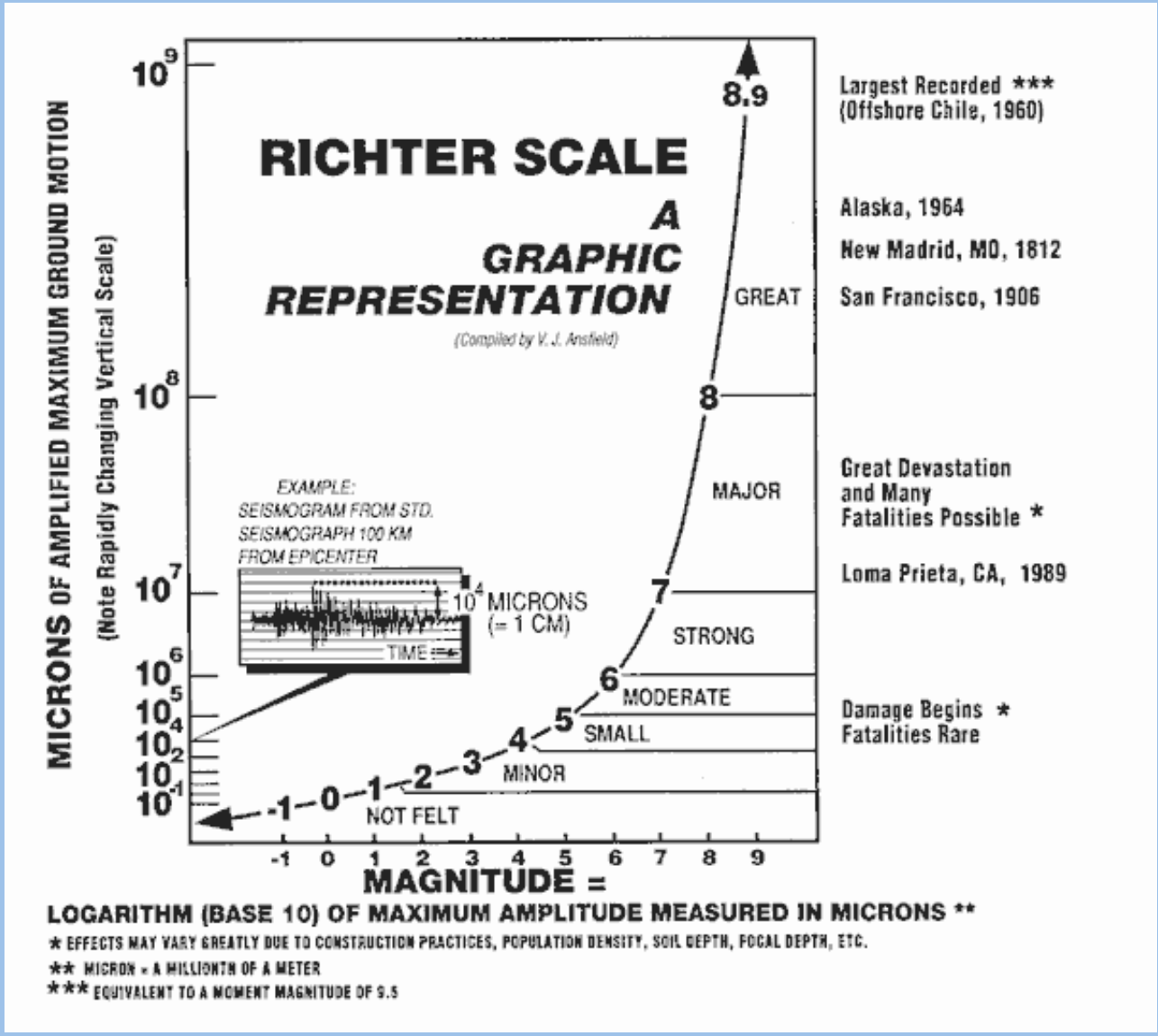
- Rule-Based Structure
  - CvC
    - Short vowel
  - CvCe
    - Long vowel
  - Scribs did not like the letter v in final position, so added the letter e
  - Final /v/ spelled [ve]
    - love
- Frequency of Occurrence
  - [fr] occurs in initial but not final position
  - Recent Letter and Word Counts
    - http://norvig.com/mayzner.html

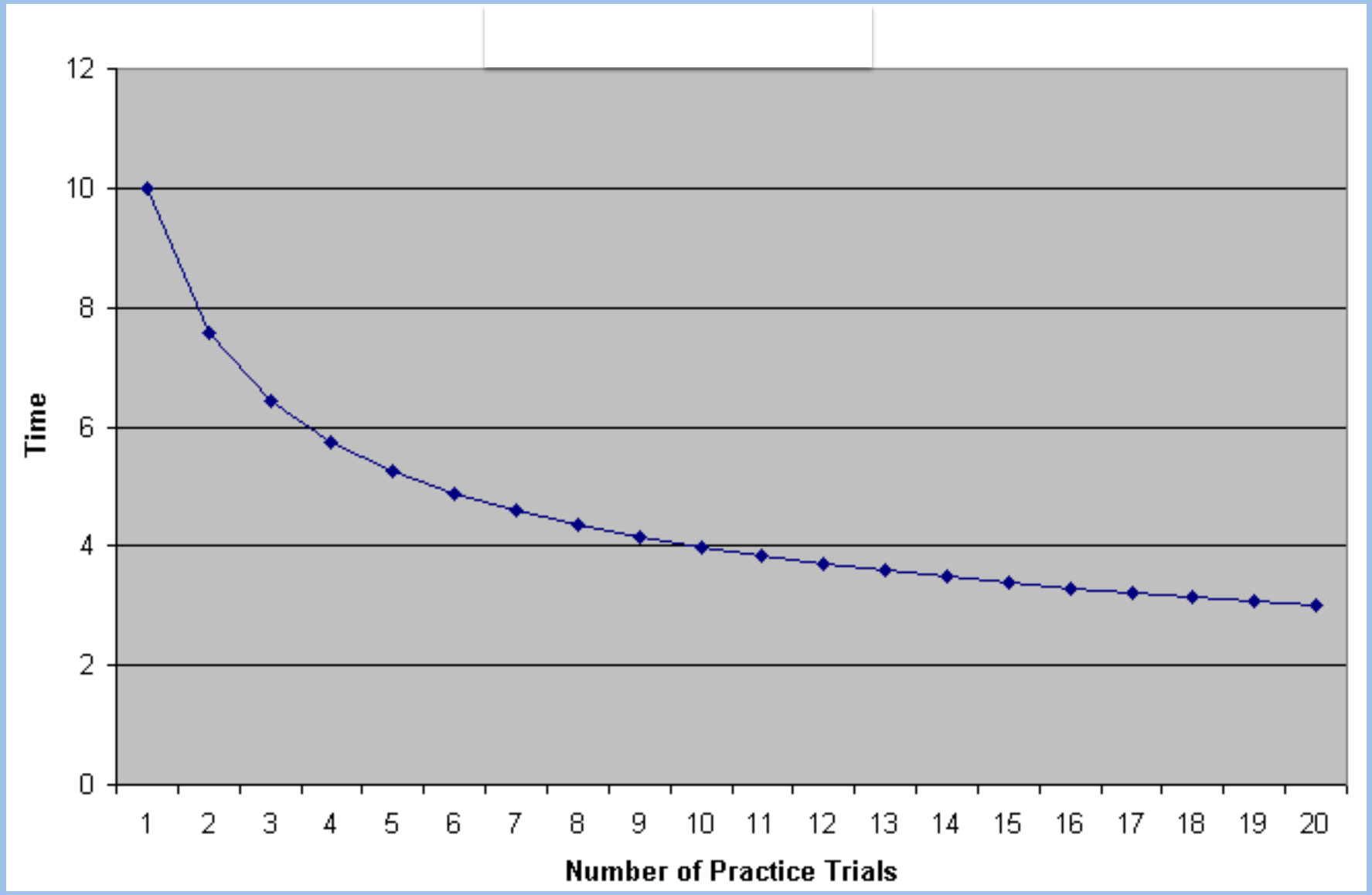
Reading Baboons

- Words vs. Nonwords
  - TRAY vs ARYU
  - 500 words
  - About 50,000 trials
- Learned the Distinction
  - 6 Baboons
    - 75% Correct

Law of Practice and Experience

People change logarithmically, not linearly




12
10
8
6
4
2
0
Time
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Number of Practice Trials

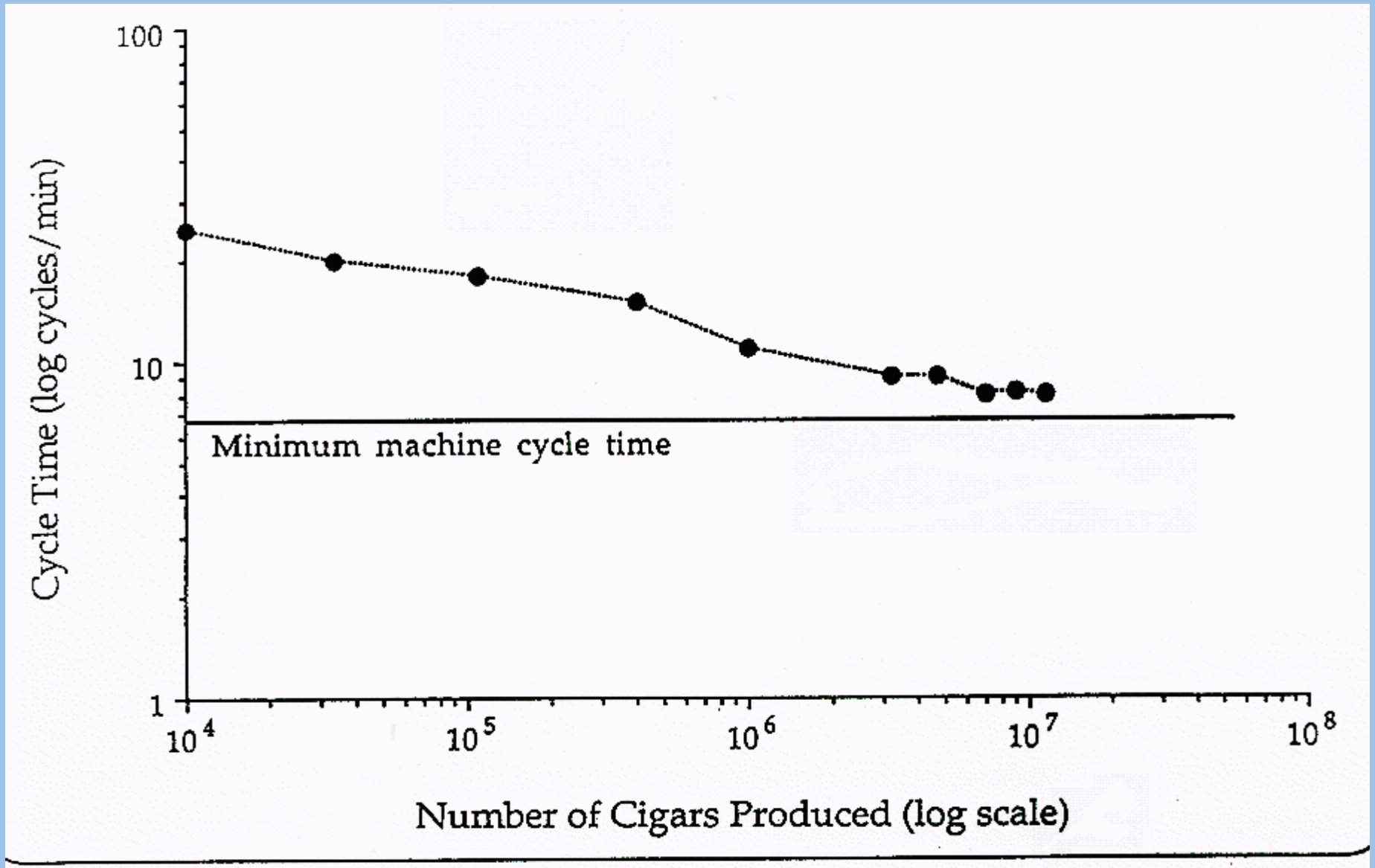
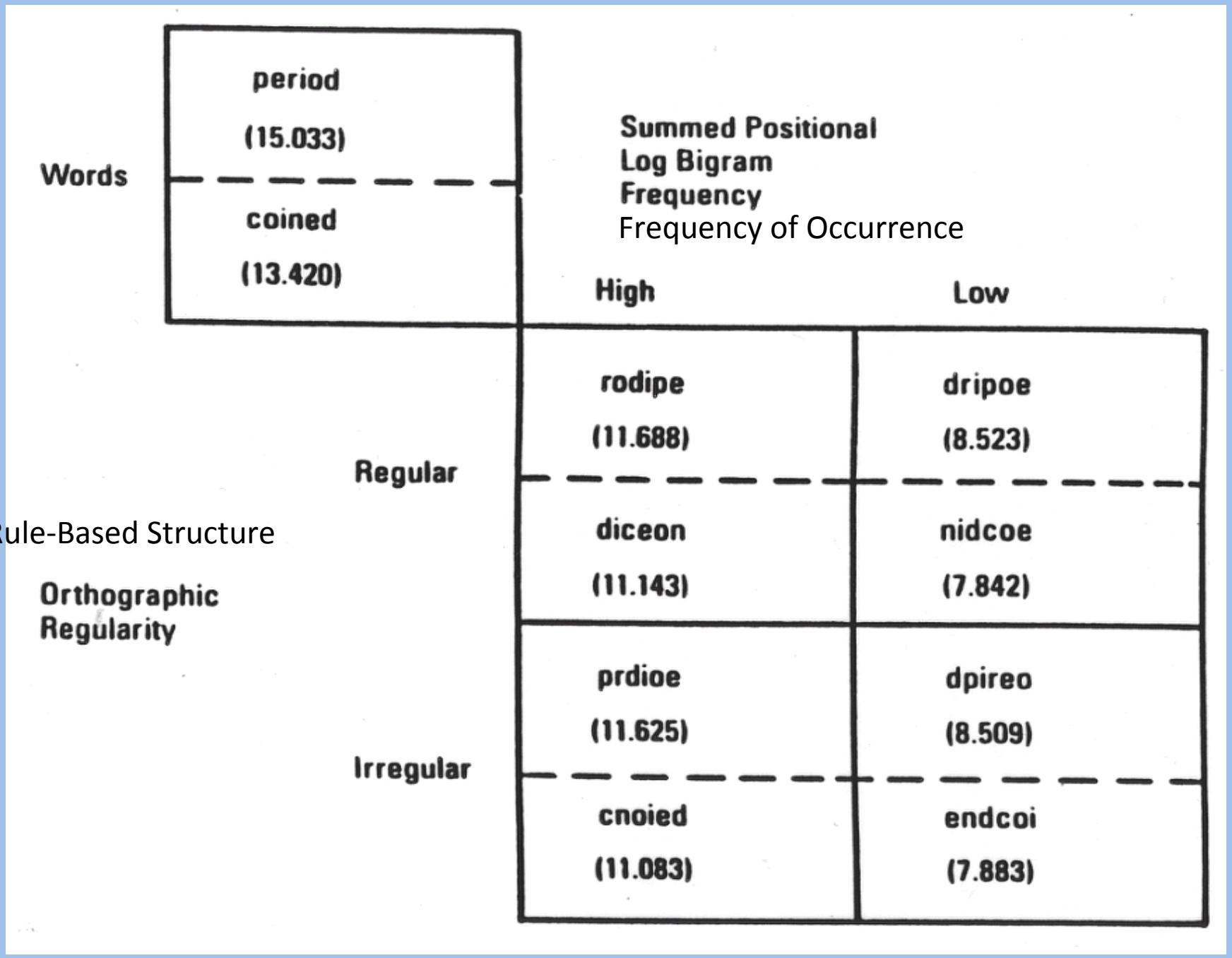
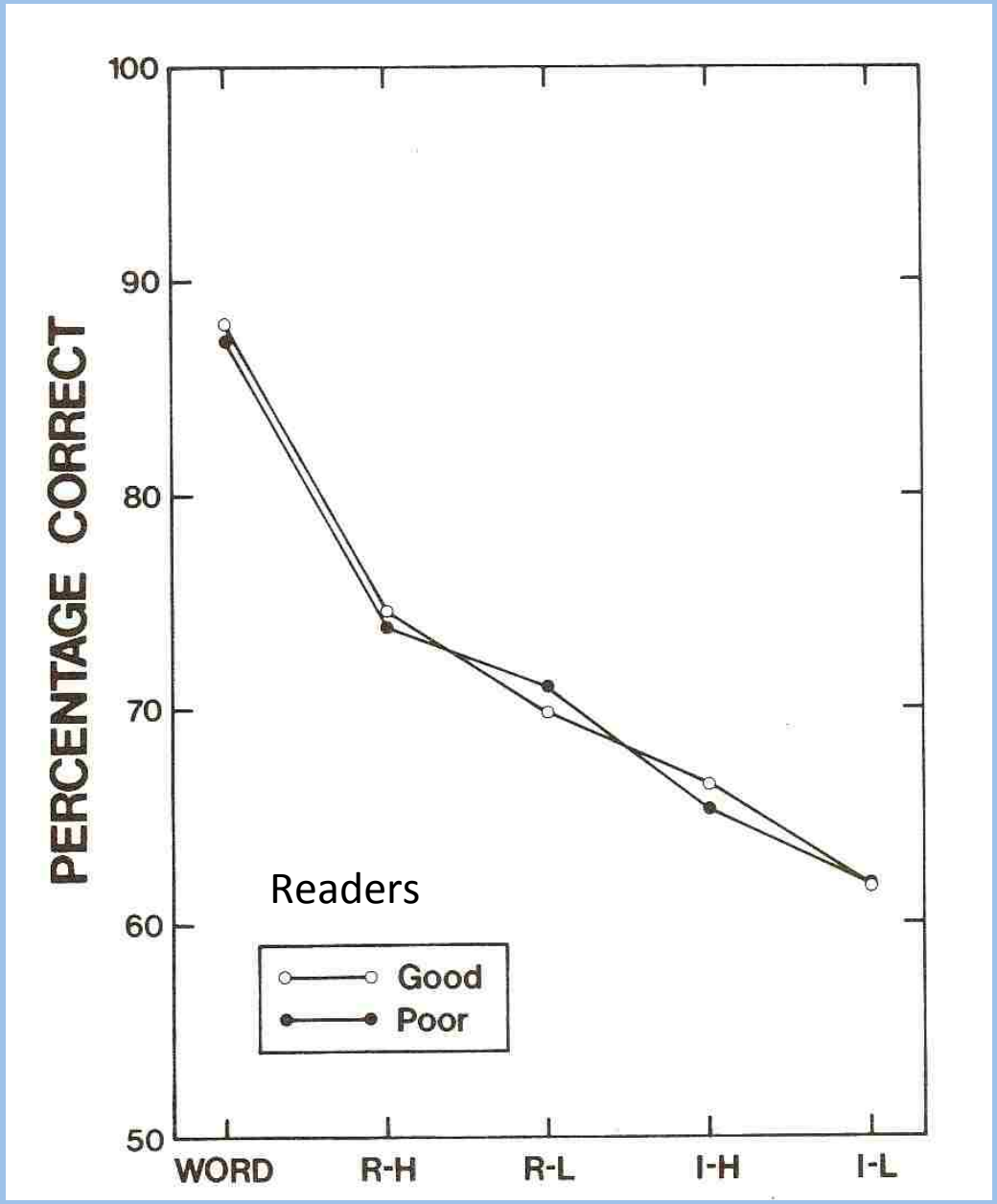
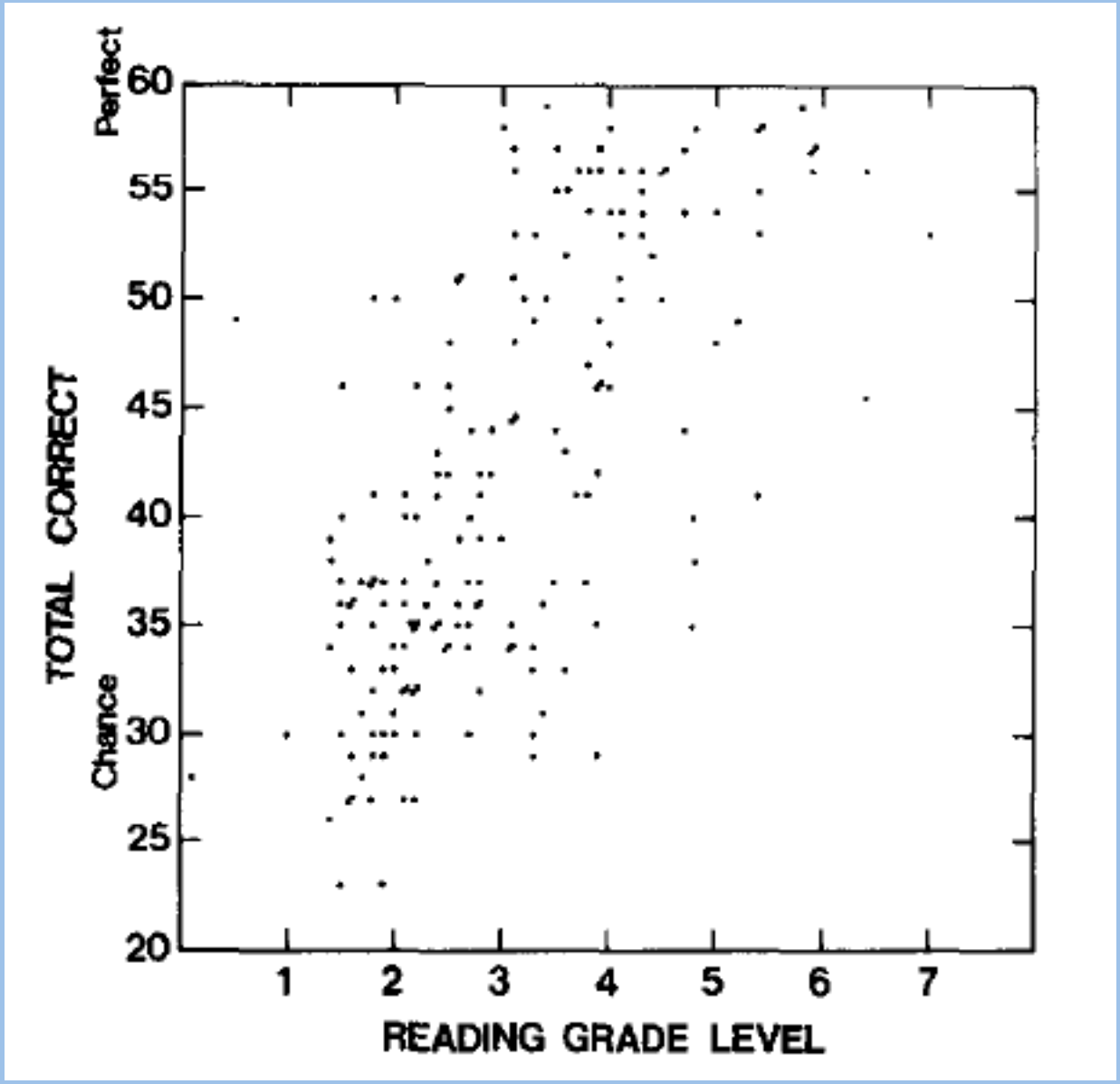


Figure 1.3. Speed of cigar making (cycle time) as a function of practice (number of cigars produced).
SOURCE = Adapted from Crossman (1959).


period
(15.033)
Words
coined
(13.420)
Summed Positional
Log Bigram
Frequency
Frequency of Occurrence
High
Low
rodipe
(11.688)
dripoe
(8.523)
Regular
diceon
(11.143)
nidcoe
(7.842)
Rule-Based Structure
Orthographic
Regularity
prdioe
(11.625)
dpireo
(8.509)
Irregular
cnoied
(11.083)
endcoi
(7.883)



Constraints

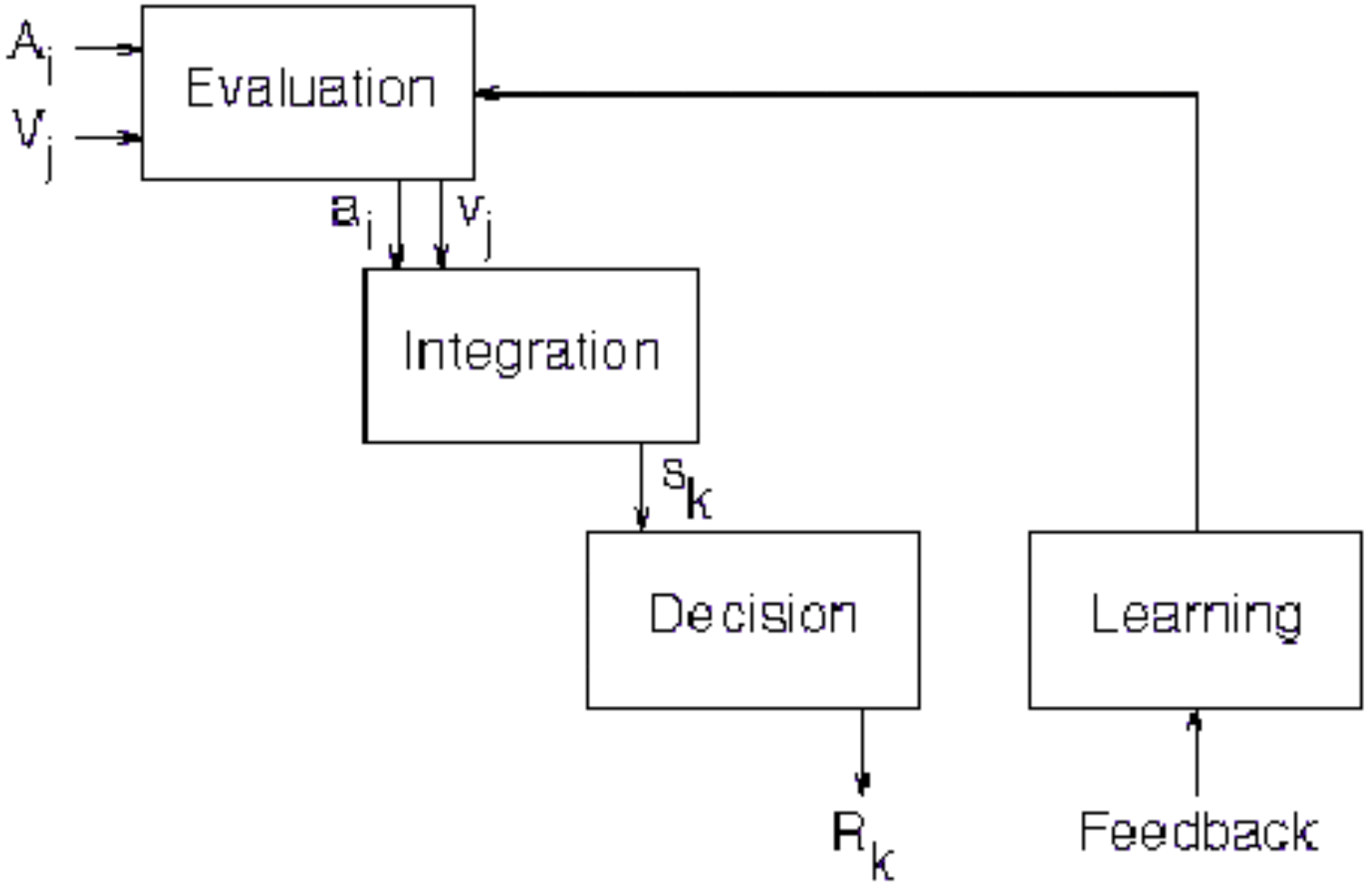

Perfect
60
55
50
45
40
35
30
Chance
25
20
TOTAL CORRECT
1
2
3
4
5
6
7
READING GRADE LEVEL

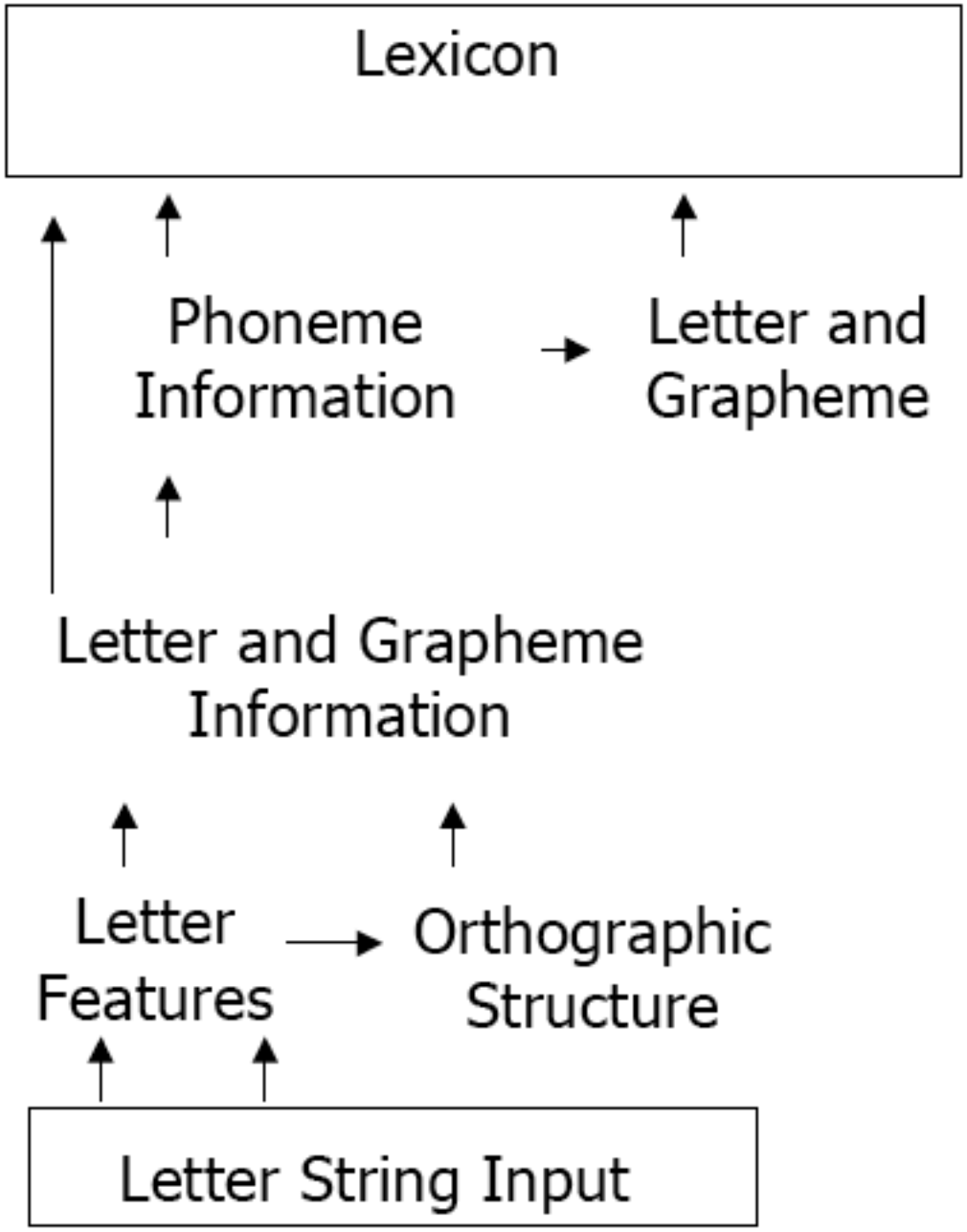
Sound/Spelling Correspondences

- Spelling-to-Sound Regularity
  - How likely a letter maps into a particular speech segment
- Sound-to-Spelling Regularity
  - How likely a speech segment maps into a particular letter or grapheme

Concept of Fluency

- Speed of Reading
- Influenced by
  - How likely letters occur
  - How likely letters map into sounds
  - How likely sounds map into letters


A_i
V_j
Evaluation
a_i
v_j
Integration
s_k
Decision
R_k
Learning
Feedback


Lexicon
Phoneme Information
Letter and Grapheme
Letter and Grapheme Information
Letter Features
Orthographic Structure
Letter String Input