

3rd Week Retrospective

- Optimizing Learning and Memory
 - Time on Task
 - Focused Attention
 - 10,000 hours for expertise
 - Distributed Practice
- Diverse Topics
 - Scientific Method
 - Behavioral Science
 - Language
 - Speech Science
 - Tutoring
 - Reading

3rd Week Retrospective

- Technology Assisted Reading Acquisition (TARA): Children Acquiring Literacy Naturally
- Language and Speech are Special
- Value of the Face; Baldi, Pattern Recognition
- Barriers to Critical Thinking
- Baldi Guides Vocabulary Learning
- Puzzle of Language Acquisition
- What's Needed for Spoken Language Acquisition?
- Solving the Puzzle of Spoken Language Acquisition

Language and Speech are Special

independent language organ

independent course of
development

not standard perception and
learning



Noam Chomsky
Univ. of Maryland, Jan. 26, 2012

Value of the Face



Barriers to Critical Thinking

- Direct Experience can be Misleading
- Overconfidence
- Confirmation Bias



Baldi Guides Vocabulary



Virtual Teachers

- Upside
 - Available 24/7
 - Can be Engaging

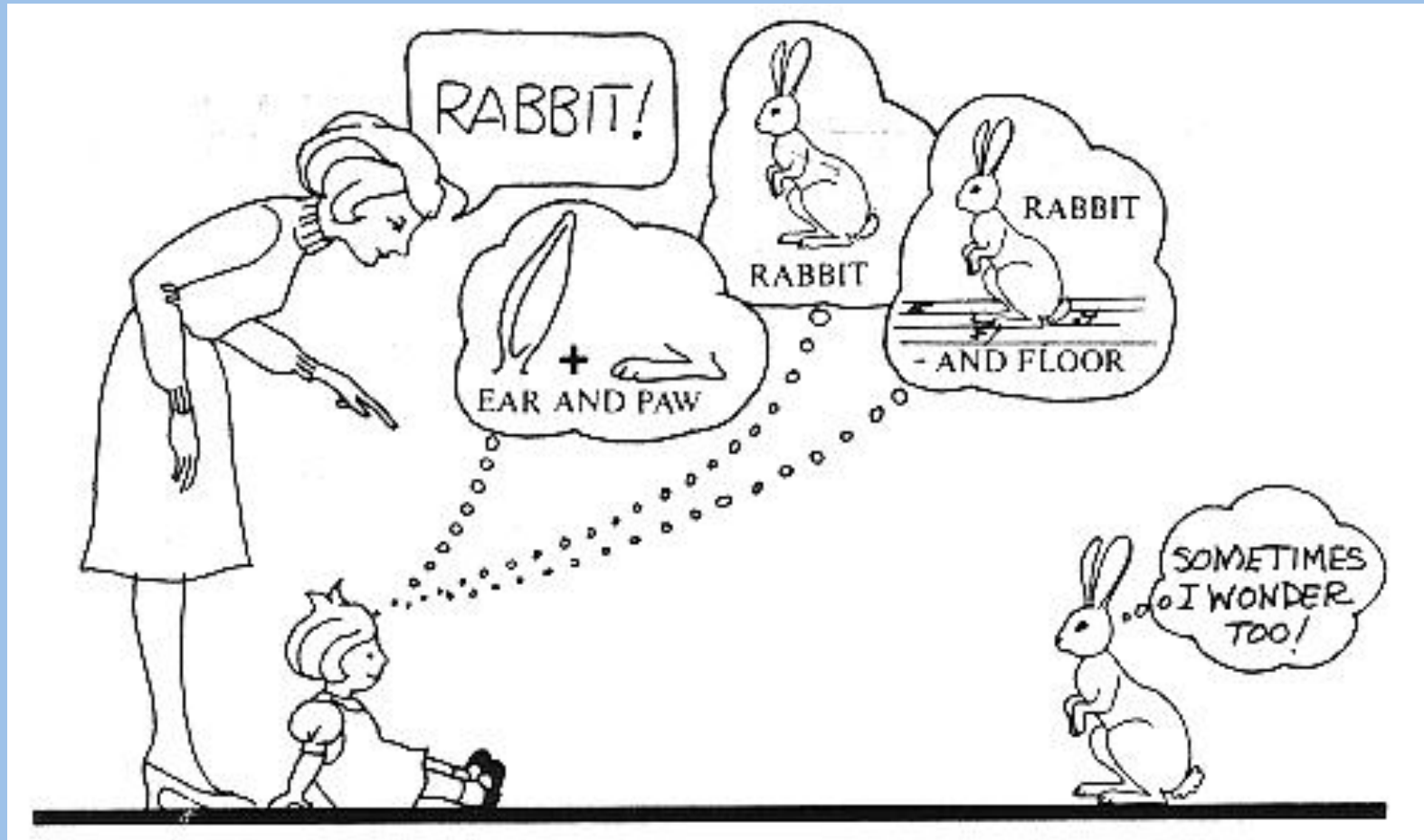


Virtual Teachers

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

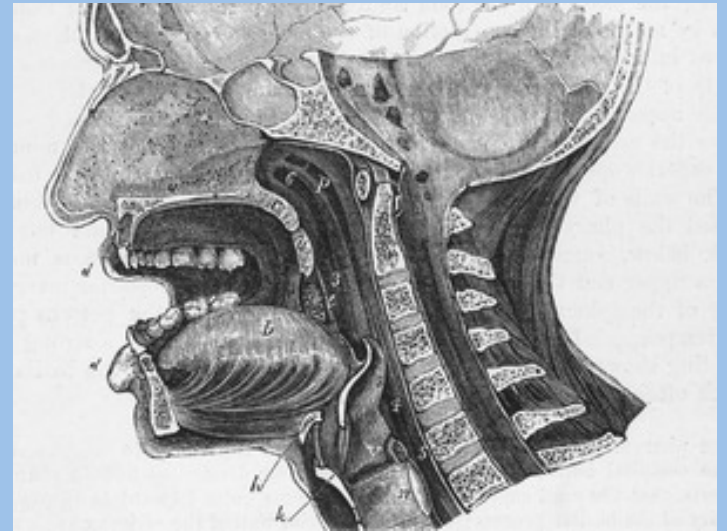


Gavagai -- Puzzle of Language Acquisition



What's Needed for Spoken Language Acquisition?

- Sensory Input
- Signal analysis
- Category Learning
- Syllabification
- Recombining Syllables



Solving the Puzzle of Spoken Language Acquisition

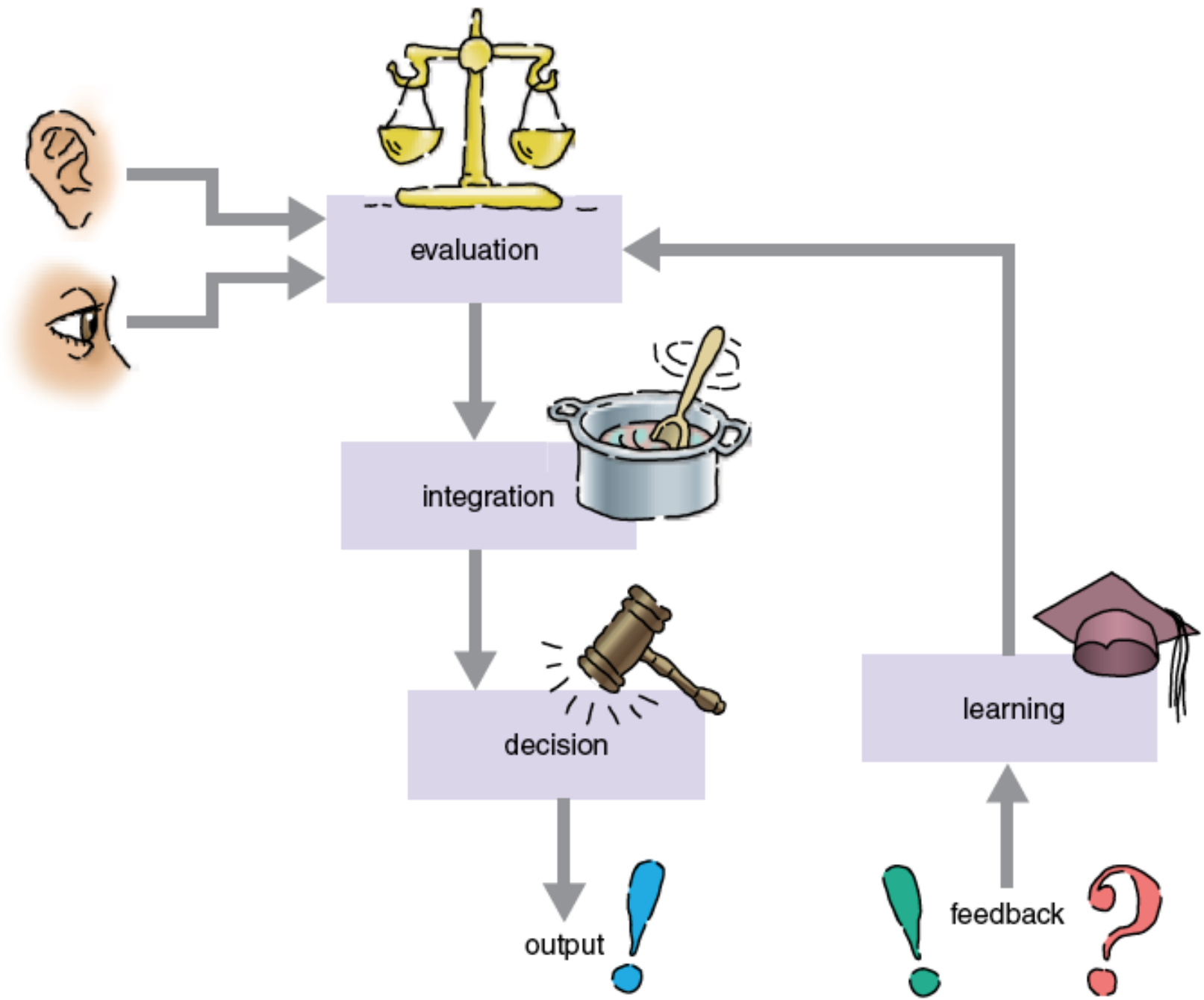
- Sensory Hardware
- Categorization
- General Learning Principles
 - Statistical Learning
 - Generalization

Saffran et al., 1996 study

- Habituation Task
 - 8-month-old Infants
 - Sequence of 3-syllable words
 - E.g., dapiku
 - 2 minute familiarization
 - Test
 - Old words versus New words
 - Old words versus Part words
 - Listened longer to New and Part Words than Old Words

Saffran et al., 1996 study

- Sequence
- Four words
 - tupiro golabu bidaku padoti
- Four Nonwords
 - tupada
- Four Part Words
 - tupiku



Fuzzy Logical Model of Perception

- Multiple Sources of Information
 - Bottom-Up
 - Top-Down
- Continuous Information
- Optimal Use (Integration) of Sources

Emergentist Coalition Model

- mapping of words onto referents
 - children rely on multiple cues
- weight given to these cues change across development.
- Example
 - Infants initially rely mostly on perceptual cues
 - Then rely more on speaker's intent and linguistic cues

Why early experiences matter



Newborn Brain

Average weight
333 grams

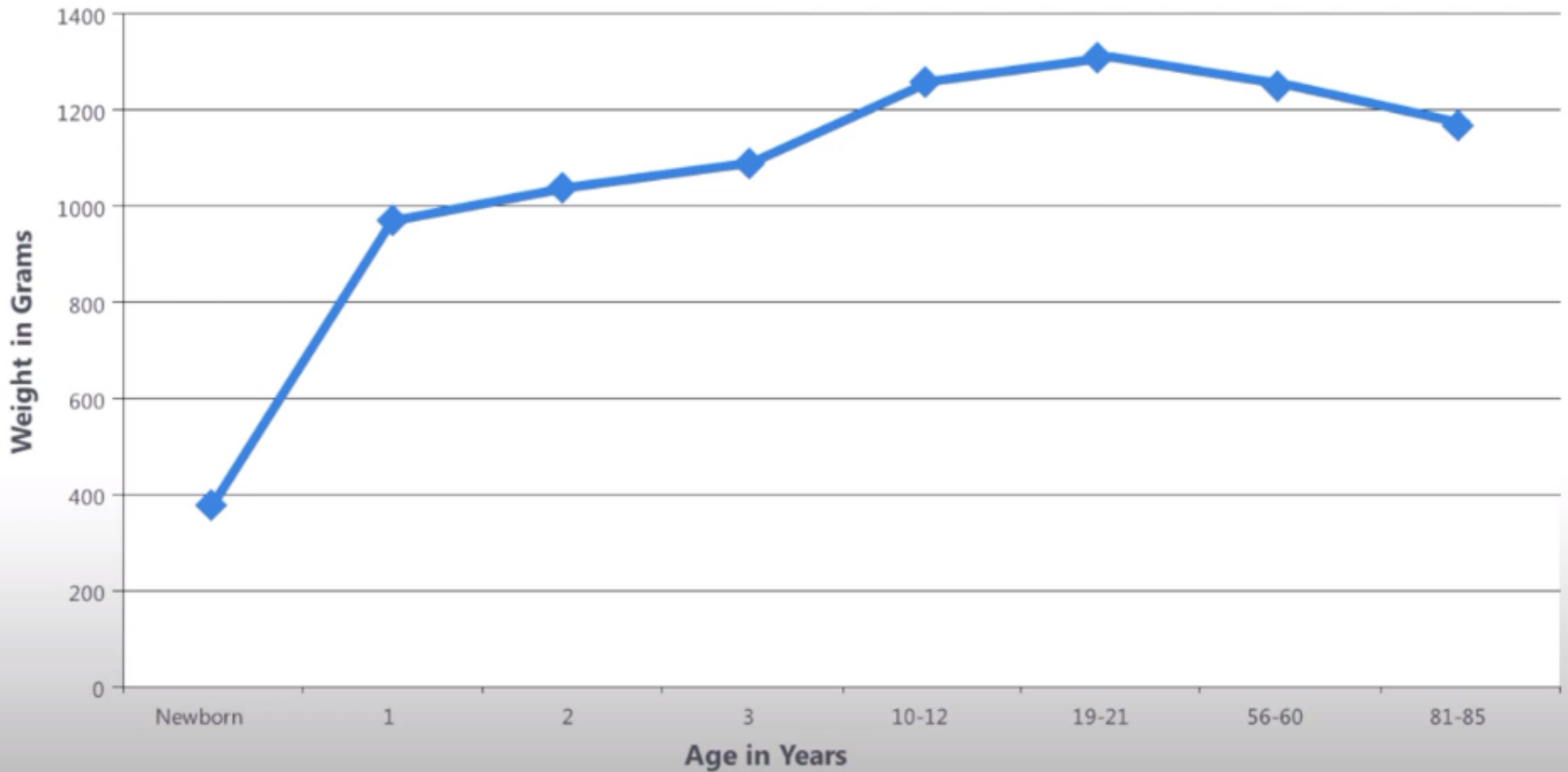


2 Year Old's Brain

Average weight
999 grams

Brain photo courtesy IsaacMao, Flickr

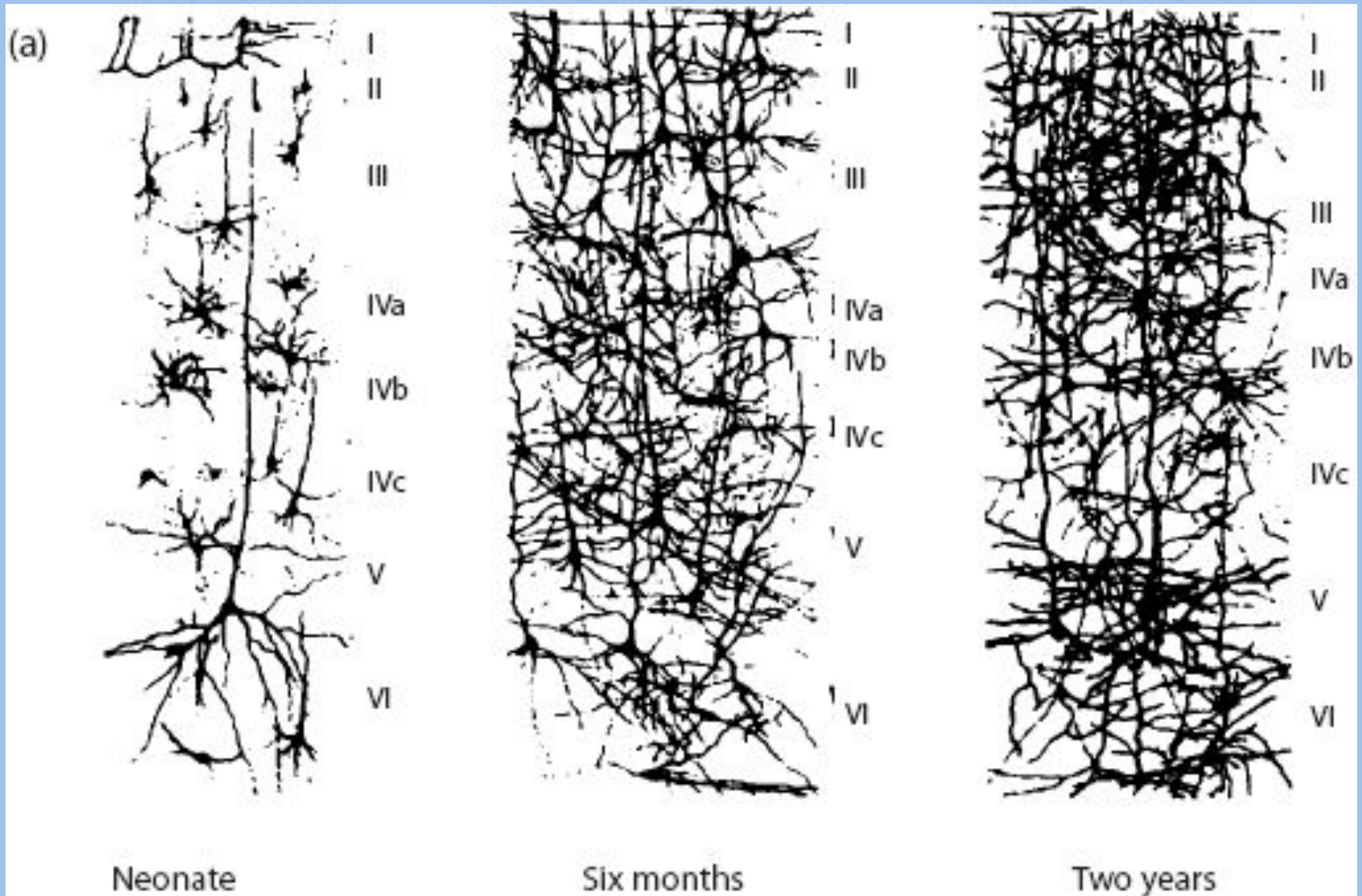
Brain Growth over the Lifespan



TEDxRainier - Dimitri Christakis - Media and Children

Childhood decides everything
John-Paul Sartre

Explosive Brain Development





Matata and Kanzi

[Kanzi, the Bonobo](#)

<http://www.youtube.com/watch?v=jKauXrp9dl4>



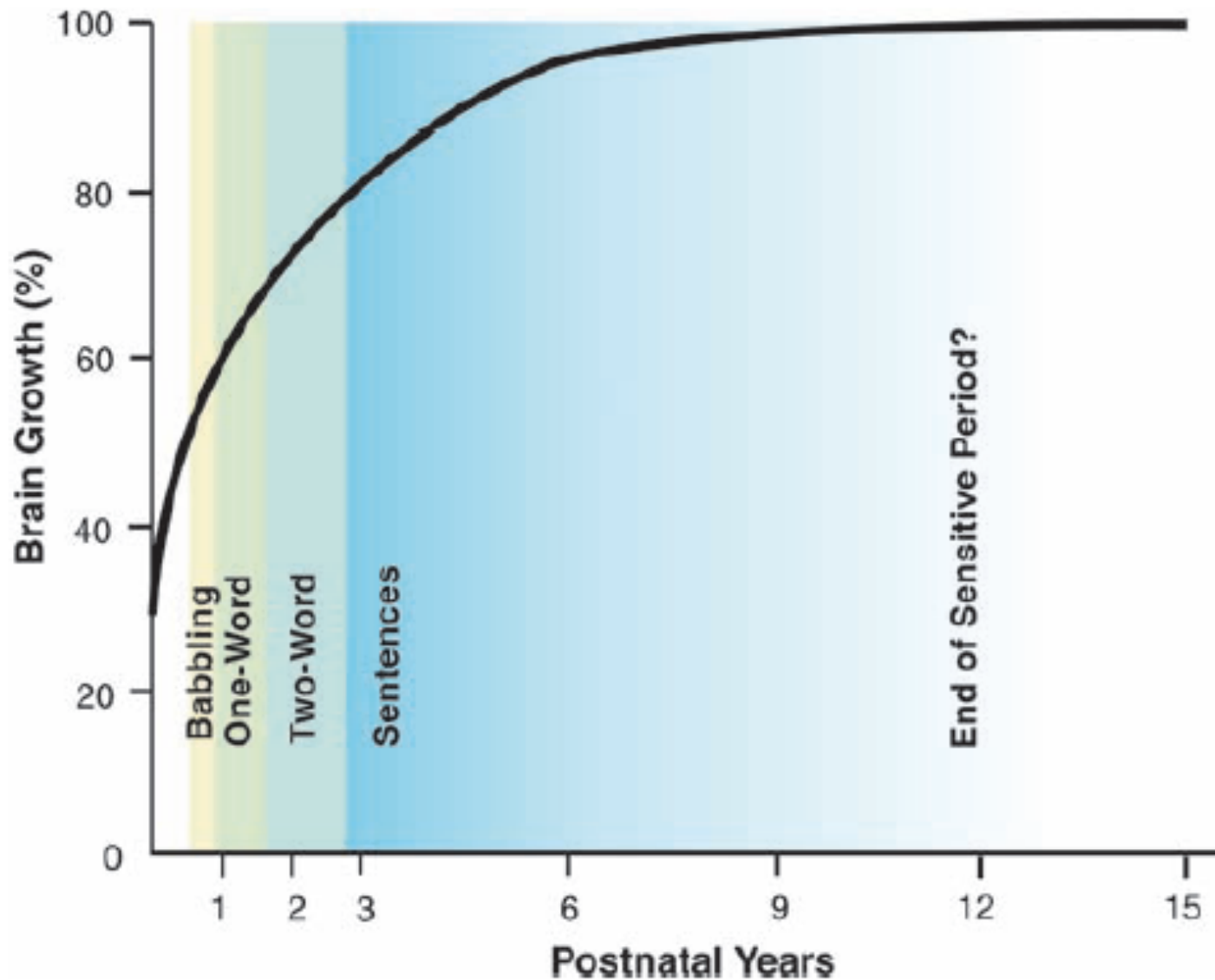


Fig. 1. Brain growth and first language (L1) acquisition. Human brain weight is presented as a function of age, where 100 in the ordinate corresponds to the mean adult value (10). Approximate times of milestones in normal speech development are also indicated.

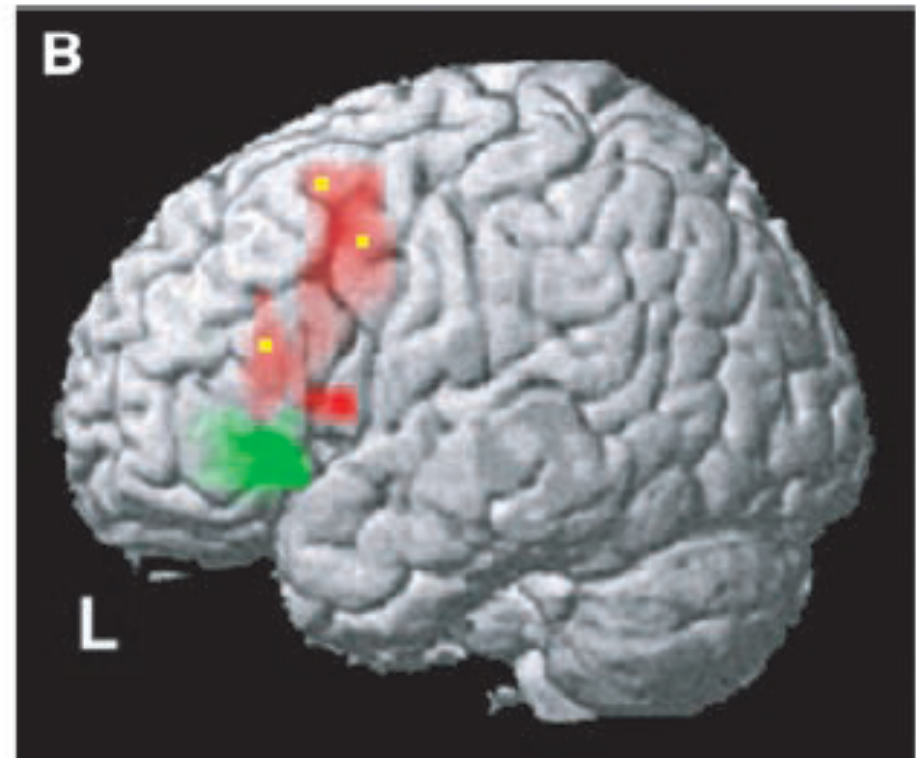
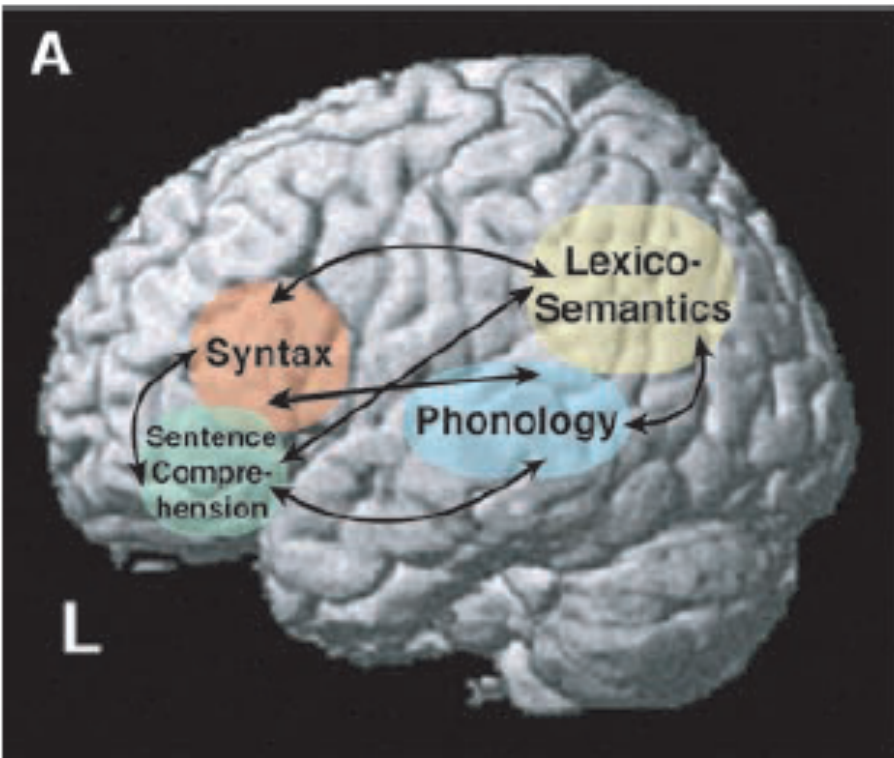


Fig. 2. (A) Possible network of fundamental linguistic functions in the brain. The exact correspondences between the left (L) brain regions and linguistic factors are still under study. (B) The grammar center and other left frontal regions critically involved in sentence processing. The green region (the left F3t/F3O) is selectively activated in the comprehension of sentences (16, 17), whereas the red regions (the left lateral premotor cortex, the left dorsal IFG, and the left F3op/F3t) are specifically involved in syntactic processing (15, 26) and can be regarded as the grammar center.

Brain regions corresponding to the four levels of language.

Critical Periods

- Auditory System
- Visual System
- Language System(s)
 - Speech
 - Sign
 - Reading (Hypothesized)

[Dr. Andrew Melthoff](#)

<http://www.youtube.com/watch?v=y4MCqFkbQXI>

Still face experiment

<http://www.youtube.com/watch?v=apzXGEbZht0>

Still Face Experiment

<http://www.youtube.com/watch?v=apzXGEbZht0>



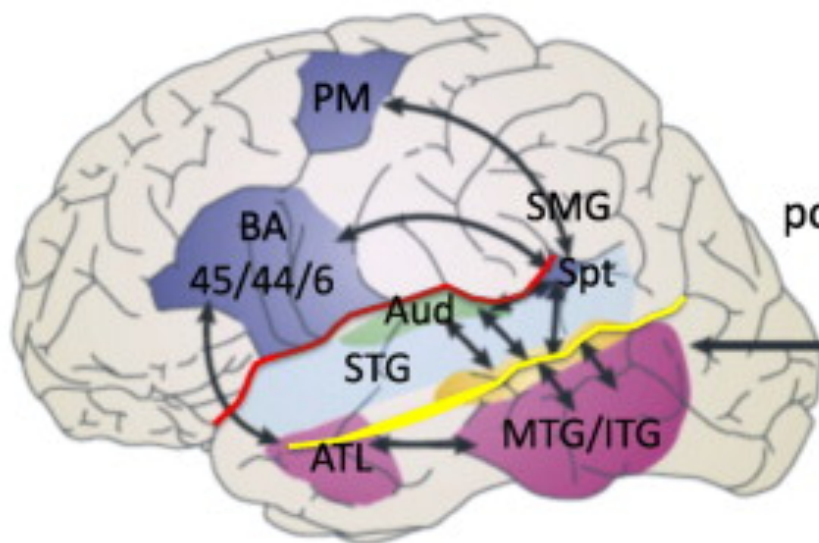
Implications:

Speech Perception versus Production

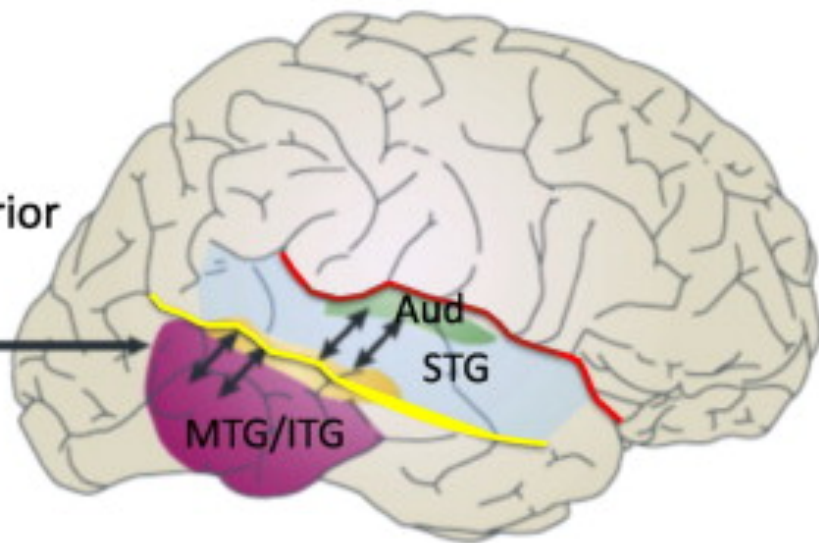
- Early Studies
 - Brain Damage
- Wernicke's Area
 - Speech Perception (Comprehension)
 - Ventral Stream
- Broca's Area
 - Speech Production
 - Dorsal Stream

dorsal/superior

anterior



posterior



ventral/inferior

Speech Perception

- Pattern Recognition
 - FLMP
 - ECM
- Motor Theory
 - Production Intervenes in Perception
 - Mirror Neurons
- Equivalent Representation
 - Both use Same Information

<http://www.youtube.com/watch?v=PZatrvNDOiE>

Language Acquisition

around 8 minutes in shows development of saying water

Roy (Ted Talk) documents about 70 instances in which his son attempted to pronounce “water” before he was able to pronounce it correctly. Many of these instances illustrate that he was able to perceive and understand the spoken word but simply unable to produce it.

The MacArthur-Bates Communicative Development Inventories (CDI) has been used to measure comprehension and production vocabulary. It uses a checklist to ask parents to report their child's word comprehension, word production, and grammar. The checklist for comprehension asks the parents to indicate which of the words on the list are understood by the child. The checklist for "Words Produced" is interpreted to mean that the child's utterance could be understood out of context by at least a caregiver.

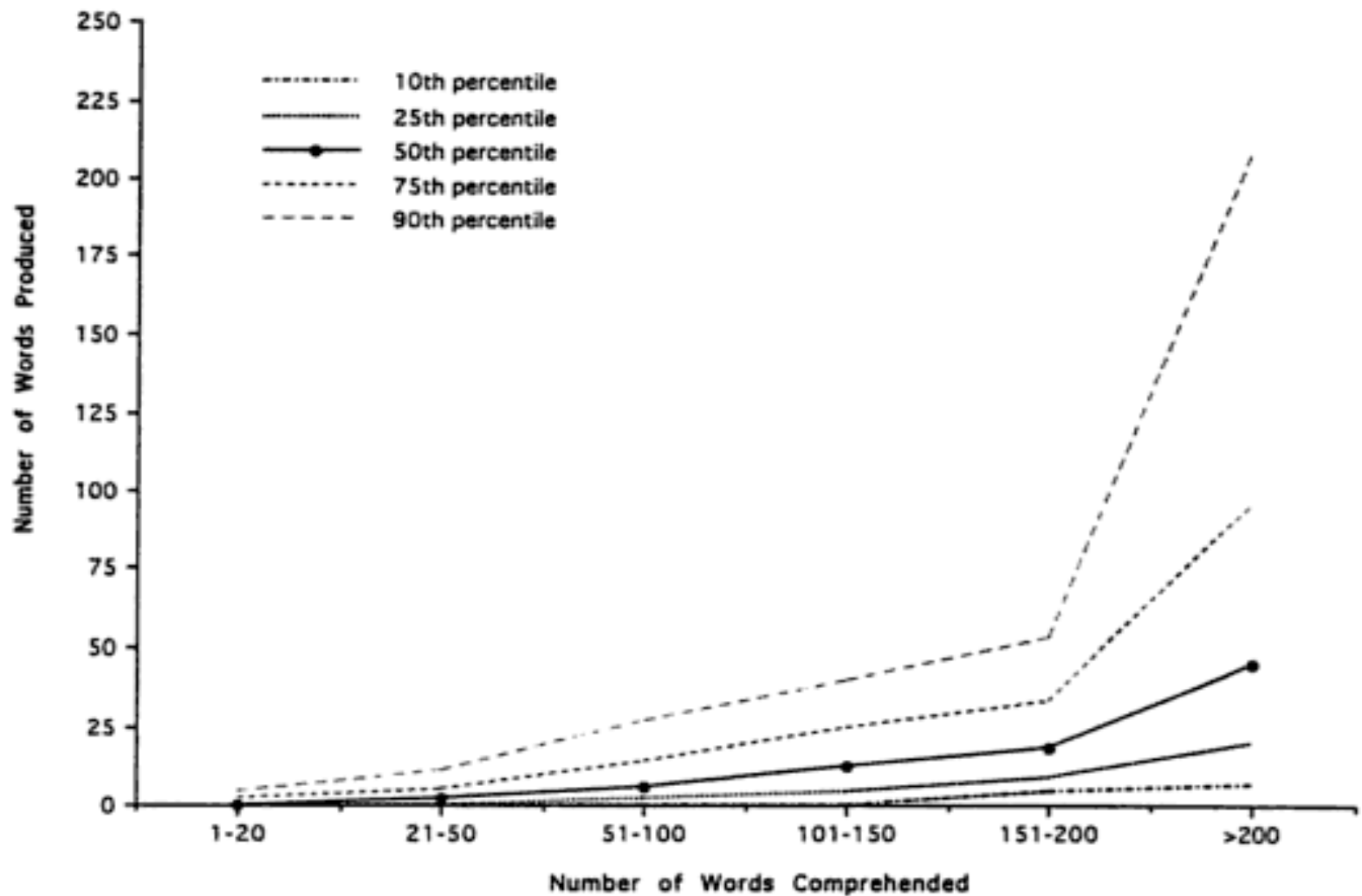
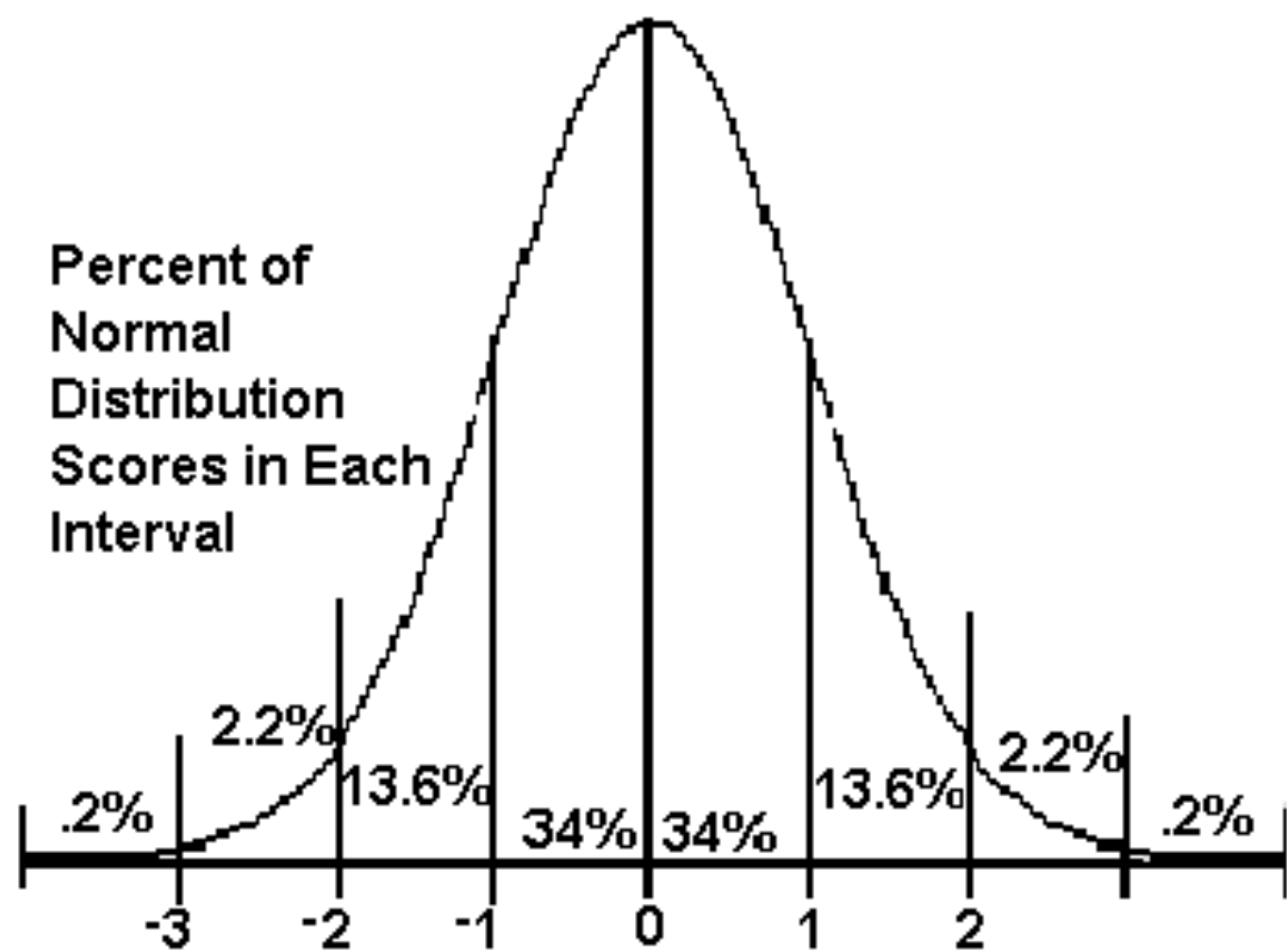


FIG. 2.6b. Variability in word production as a function of comprehension vocabulary size. From Fenson et al. (1994).

**Percent of
Normal
Distribution
Scores in Each
Interval**



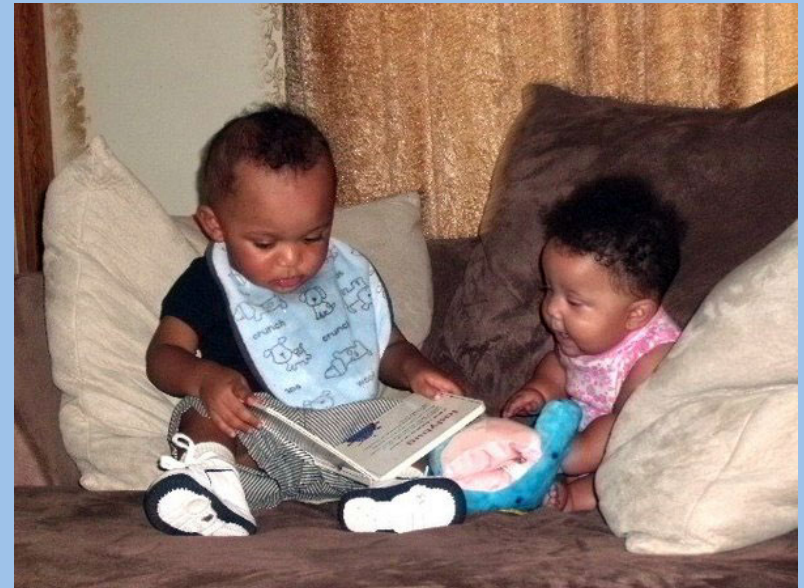
Produced	Average Understood	Average Produced	Cases
0	45.63	0	176
1-3	58.70	1.91	194
4-7	76.74	5.39	183
8-17	116.21	12.59	172
18-49	168.44	29.29	211
51-376	264.69	120.11	153
			1089

Table 1. The individual results of 1089 children giving the number of words produced, the number of words understood, and the number of cases contributing to each row of the analysis.

What's Needed for Literacy?

Written Language!

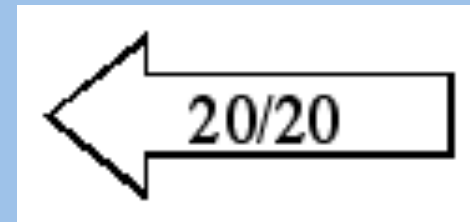
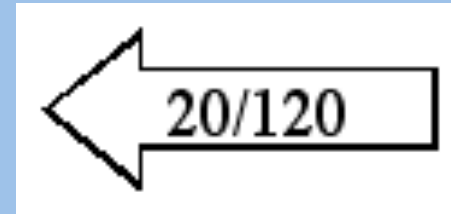
- See Things
- Signal analysis
- Learn Categories



Development of Infant Visual Tracking. Activity 1 from What Babies Can Do DVD.3gp
<http://www.youtube.com/watch?v=cCFzqcje838&playnext=1&list=PL54EF5B2904E8CA12>



Babies can see more than you might think!



1 month 20/120

4 months 20/60

8 months 20/30 <http://www.ski.org/>

[Vision/babyvision.html](http://www.ski.org/Vision/babyvision.html)

Original Image

WORD

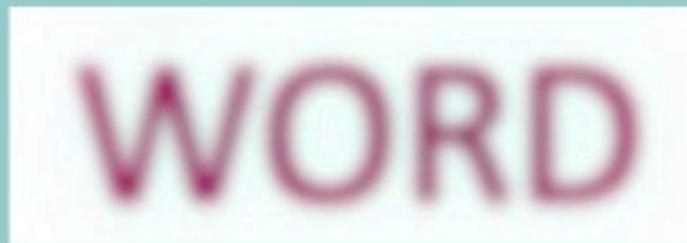
4-week old at 24 inches



8-week old at 24 inches



3-month old at 24 inches



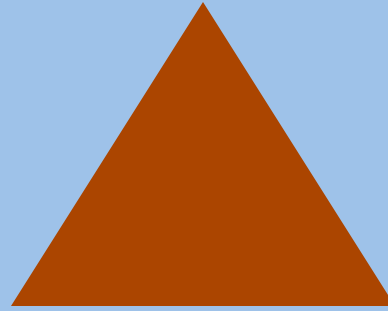
6-month old at 24 inches



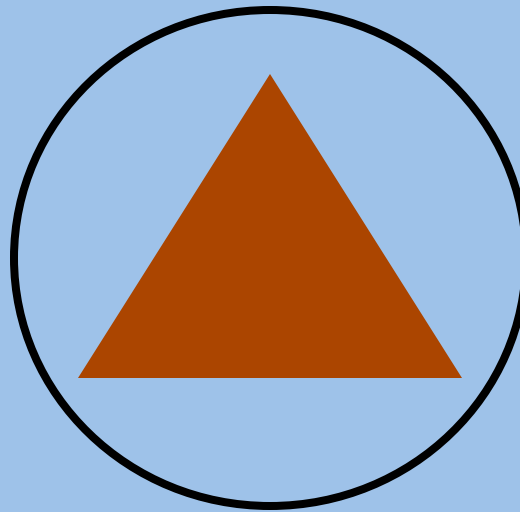
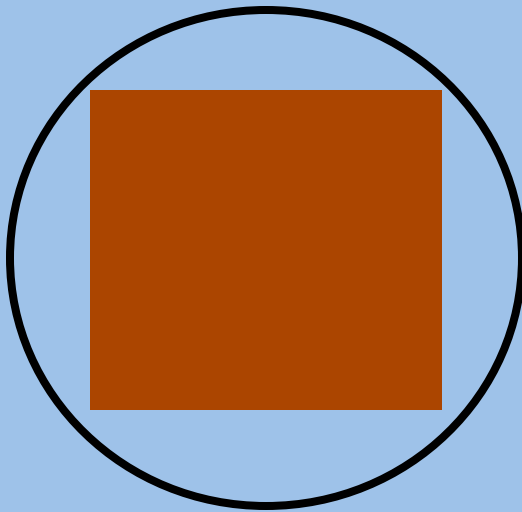
Adult at 24 inches



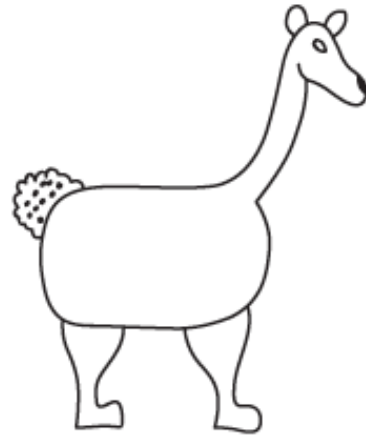
One-Month Old Infants Can See



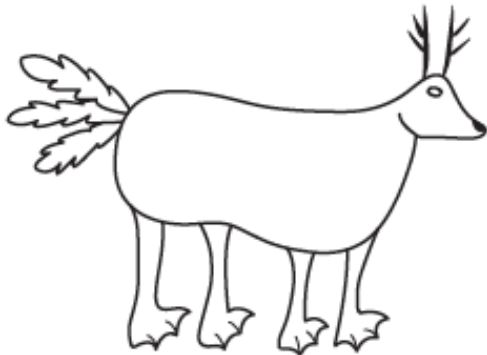
Two-Month Old Infants Can See



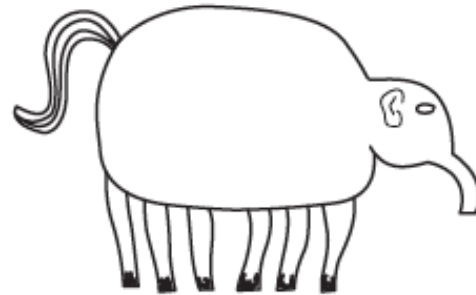
Babies can categorize objects.



12221



21112



33333

Younger and Cohen 1983

Can Infants Learn to Read

- Make Eye Movements
- Have Good Acuity
- Can Categorize Objects
- But Can They Read?

Naturally Acquired Literacy?

Linguists regard speaking, signing, and language Comprehension as primary faculties of language, i.e., innate or inherent and biologically determined,

whereas they regard reading and writing as secondary abilities. Indeed, the native or first language (L1) is acquired during the first years of life through such primary faculties while children are rapidly expanding their linguistic knowledge (2). In contrast, reading and writing are learned with much conscious effort and repetition, usually at school.

Current Dogma

- Speech is Natural
 - Is Acquired Unintentionally
- Reading is Artificial
 - Must be Taught

“Unlike its component parts such as vision and speech, which are genetically organized, reading has no direct genetic program passing it on to future generations.” Maryanne Wolf (2007). *Proust and the squid: The story and science of the reading brain*. New York: HarperCollins.

<http://www.youtube.com/watch?v=1Vys9jvXwcU>

17 month old baby reading

<http://www.youtube.com/watch?v=MaJ4OvDCqkl>

Smart Baby Reading at 12 Months (Part 1)

<http://www.youtube.com/watch?v=PRdQCSPvxco>

1 Year Old Baby

<http://www.youtube.com/watch?v=wOUxUtEc2DQ>

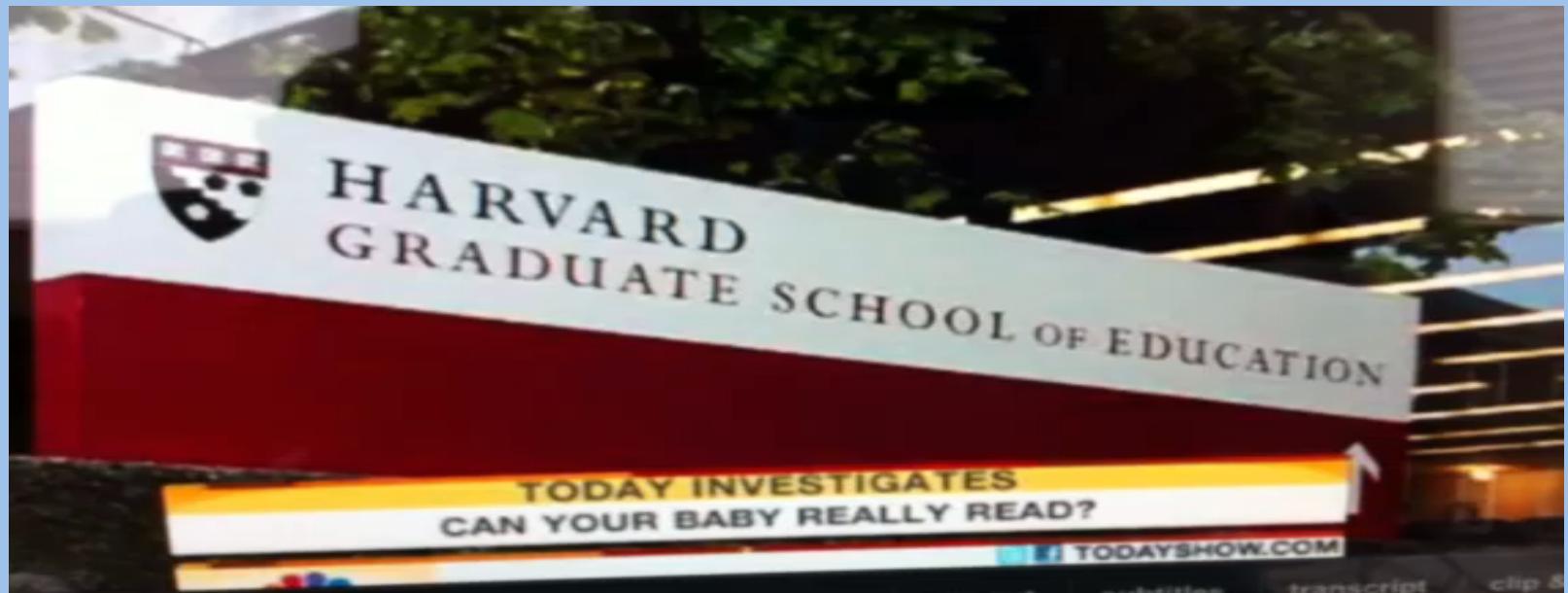
Smart Baby Reading at 12 Months (Part 2)

http://www.youtube.com/watch?v=hBxNQ_cmB0c

Reading Chinese

NBC Today Show Expose

- Little Brains Can't Read
- Aren't Really Reading
- Doesn't Help Later Reading

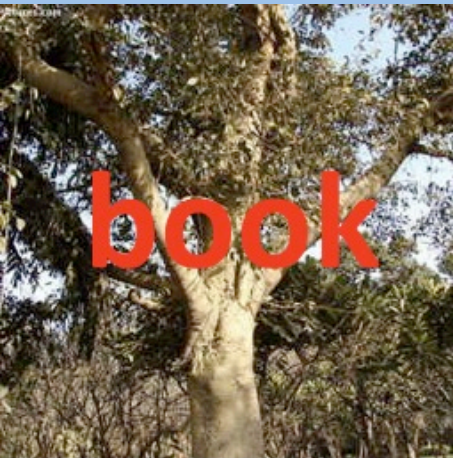


<http://www.today.com/id/39953918/ns/today-money/t/your-baby-can-read-claims-overblown-experts-say/#.UW7kCoJTUfw>

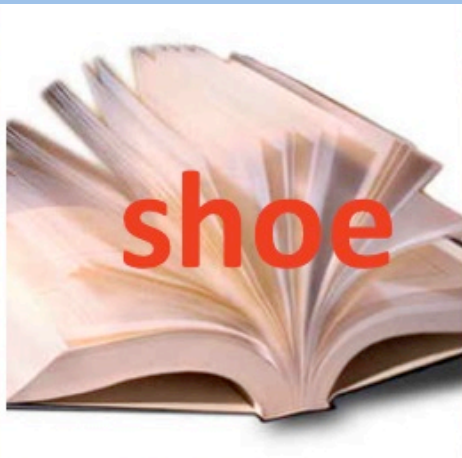


Can Infants Learn to Read

- Make Eye Movements
- Have Good Acuity
- Can Categorize Objects
- But Can They Read?
- How do we read?



book



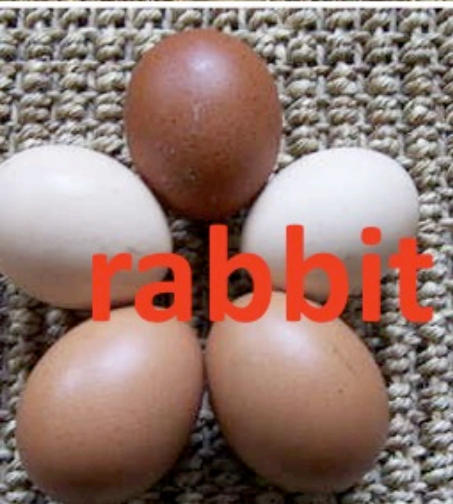
shoe



eggs



ring



rabbit



tree



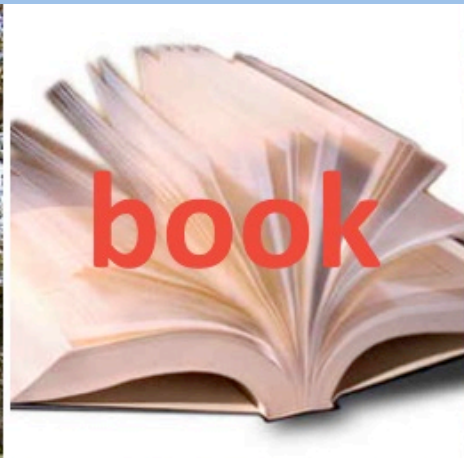
nest



baby



tree



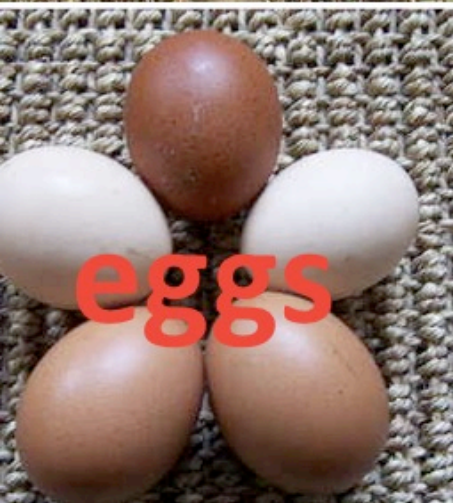
book



shoe



nest



eggs



baby



rabbit



ring

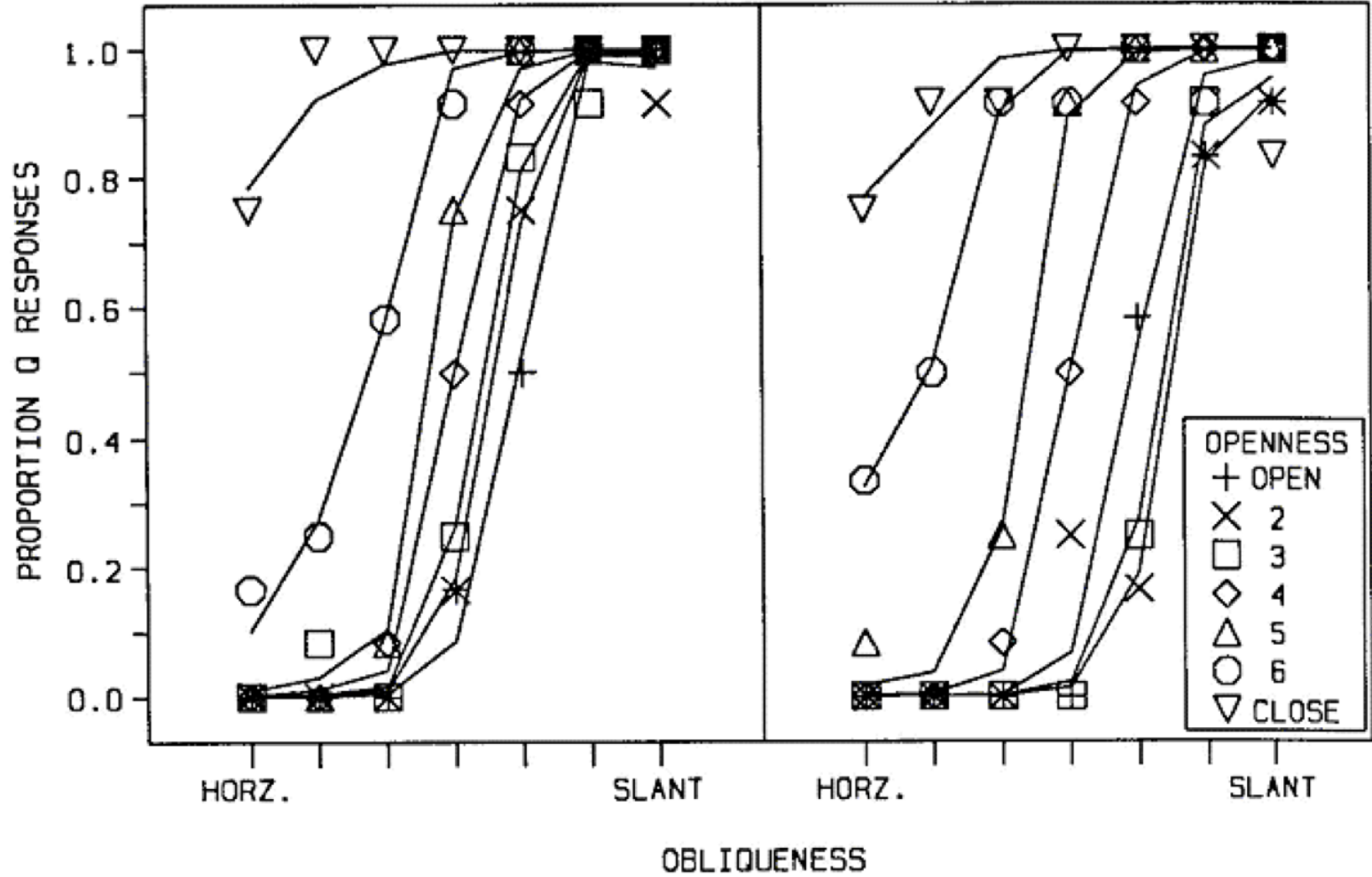
How don't we read?

According to a researcher at an English university, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter are in the right place. The rest can be a total mess and you can still read it without problem. This is because we do not read every letter by itself but the word as a whole.

wish wash
short shoot
wide wife
while whole
whose where
week weak
tree true
step stop

SUBJECT 5

SUBJECT 6



near snow acne sign
near snow acne sign
near snow acne sign
near snow acne sign
hear show ache sigh
hear show ache sigh

nurt tnis ecno disn
nurt tnis ecno disn
nurt tnis ecno disn
nurt tnis ecno disn
hurt this echo dish
hurt this echo dish

nice knap sing coin
nice knap sing coin
nice knap sing coin
nice knap sing coin
hice khap sihg coih
hice khap sihg coih

ndye snge tinr tlan
ndye snge tinr tlan
ndye snge tinr tlan
ndye snge tinr tlan
hdye shge tihr tlah
hdye shge tihr tlah

