Reminders

- Exam 3.
  - on March 22
  - Review Session on Monday, March 21 at 7:00pm - 8:00pm in EE 129 (here)
  - Study Guide to be posted by tomorrow

Thinking and Language

Chapter 9
Psy12000
Spring, 2011

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Objectives

- What are the basic structures of language
- Describe development of language in children
- Can/do animals communicate?
- What is the relationship between language and thinking? Is one necessary for the other to occur?
- What are different types of thinking? How accurate are they? How quick are they?

Language

Language, our spoken, written, or gestured work, is the way we communicate meaning to ourselves and others.

M & E Bernheim Woodfin Camp & Associates

Language transmits culture.

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Noam Chomsky (1972)

"When we study human language we are approaching what some might call the 'human essence,' the qualities of mind that are, so far as we know, unique to humans"

The Importance of Language

- http://www.youtube.com/watch?v=OuUAPVFFCRQ&feature=fvwrel

Recommended YouTube Videos on Language

Language Acquisition 1-4

- http://www.youtube.com/watch?v=PZatrvNDOiE&feature=related
- http://www.youtube.com/watch?v=dsaqD9FVRsM&feature=related
- http://www.youtube.com/watch?v=oimnxkEj4ns
- http://www.youtube.com/watch?v=UTbI-G42JoY&feature=related

Language Structure

Phonemes: (phonema [Greek]: a sound uttered)
The smallest distinct sound unit in a spoken language. For example:

bat, has three phonemes $b \cdot a \cdot t$

chat, has three phonemes $ch \cdot a \cdot t$

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Language Structure

Morpheme: The smallest unit that carries a meaning. It may be a word or part of a word. For example:

Milk = *milk*
Pumpkin = *pump . kin*
Unforgettable = *un · for · get · table*

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Structuring Language

Phonemes	Basic sounds (a bit more than 40 in English) … *ea, sh.*
Morphemes	Smallest meaningful units (100,000) … *un, for.*
Words	Meaningful units (290,500) … *meat, pumpkin.*
Phrase	Composed of two or more words (326,000) … *meat eater.*
Sentence	Composed of many words (infinite) … *She opened the jewelry box.*

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Grammar

Grammar is the system of rules in a language that enable us to communicate with and understand others.

Grammar

Semantics   Syntax

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Semantics

Semantics is the set of rules by which we derive meaning from morphemes, words, and sentences. For example:

Semantic rule tells us that adding *–ed* to the word *laugh* means that it happened in the past.

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Syntax

Syntax consists of the rules for combining words into grammatically sensible sentences. For example:

In English, syntactical rule says that adjectives come before nouns; *white house*. In Spanish, it is reversed; *casa blanca*.

Earrings Tiny Red Two

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Language Development

Children learn their native languages much before learning to add 2+2.

We learn, on average (after age 1), 3,500 words a year, amassing 60,000 words by the time we graduate from high school.

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When do we learn language?

Babbling Stage:
Beginning at 4 months, the infant spontaneously utters various sounds, like *ah-goo*. Babbling is not imitation of adult speech.

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When do we learn language?

One-Word Stage: Beginning at or around his first birthday, a child starts to speak one word at a time and is able to make family members understand him. The word *doggy* may mean *look at the dog out there*.

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When do we learn language?

Two-Word Stage: Before the 2nd year a child starts to speak in two-word sentences. This form of speech is called telegraphic speech because the child speaks like a telegram: "Go car," means *I would like to go for a ride in the car.*

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When do we learn language?

Longer phrases: After telegraphic speech, children begin uttering longer phrases (*Mommy get ball*) with syntactical sense, and by early elementary school they are employing humor.

You never starve in the desert because of all the sand-which-is there.

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When do we learn language?

SUMMARY OF LANGUAGE DEVELOPMENT

Month (approximate)	Stage
4	Babbles many speech sounds.
10	Babbling resembles household language.
12	One-word stage.
24	Two-word, telegraphic speech.
24+	Language develops rapidly into complete sentences.

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Question?

Is it through nature or nurture that
we learn how to speak?

Explaining Language Development

1. Operant Learning: Skinner (1957, 1985) believed that language development may be explained on the basis of learning principles such as association, imitation, and reinforcement.

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Explaining Language Development

2. Inborn Universal Grammar: Chomsky (1959, 1987) opposed Skinner's ideas and suggested that the rate of language acquisition is so fast that it cannot be explained through learning principles, and thus most of it is inborn.

22
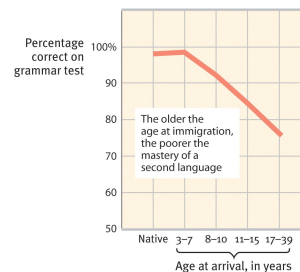
Explaining Language Development

3. Statistical Learning and Critical Periods: Well before our first birthday, our brains are discerning word breaks by statistically analyzing which syllables in *hap-py-ba-by* go together. These statistical analyses are learned during critical periods of child development.
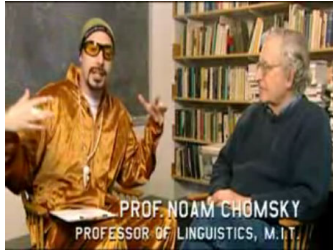

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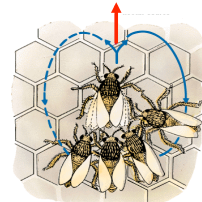## Language & Age

Learning new languages gets harder with age.

Percentage correct on grammar test

The older the age at immigration, the poorer the mastery of a second language

100%
90
80
70
60
50

Native 3–7 8–10 11–15 17–39

Age at arrival, in years

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Another Interview with Noam Chomsky

PROF. NOAM CHOMSKY
PROFESSOR OF LINGUISTICS, M.I.T.

http://www.youtube.com/watch?v=fOIM1_xOSro
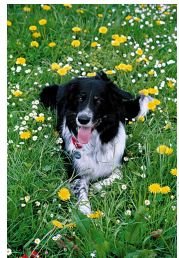
Animals & Language

Do animals have a language?

Honey bees communicate by dancing. The dance moves clearly indicate the direction of the nectar.

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Do Animals Exhibit Language?

There is no doubt that animals communicate.

Vervet monkeys, whales and even honey bees communicate with members of their species and other species.

Rico (collie) has a 200-word vocabulary   27

The Case of Apes

Chimps do not have a vocal apparatus for human-like speech (Hayes & Hayes,1951). Therefore, Gardner and Gardner (1969) used American Sign Language (ASL) to train Washoe, a chimp, who learned 182 signs by the age of 32.

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Teaching Language to Chimpanzees

• Video on animal language

Washoe (1965-2007)

Lucy Temerlin (1964-1987)

See also:
http://www.guardian.co.uk/science/video/2010/oct/13/chimpanzee-gorilla-vocalisation-body-language

Gestured Communication

Animals, like humans, exhibit communication through gestures. It is possible that vocal speech developed from gestures during the course of evolution.

Many psychologists study nonverbal and paraverbal communication

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Sign Language

American Sign Language (ASL) is instrumental in teaching chimpanzees a form of communication.

When asked, this chimpanzee uses a sign to say it is a baby.

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Computer Assisted Language

Others have shown that *bonobo pygmy chimpanzees* can develop even greater vocabularies and perhaps semantic nuances in learning a language (Savage-Rumbaugh, 1991). *Kanzi and Panbanish* developed vocabulary for hundreds of words and phrases.

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Criticism

1. Apes acquire their limited vocabularies with a great deal of difficulty, unlike children who develop vocabularies at amazing rates.
2. Chimpanzees can make signs to receive a reward, just as a pigeon who pecks at the key receives a reward. However, pigeons have not learned a language.
3. Chimpanzees use signs meaningfully but lack syntax.
4. Presented with ambiguous information, people tend to see what they want to see.

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Language & Thinking

Language and thinking intricately intertwine.

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Language Influences Thinking

Linguistic Determinism: Whorf (1956) suggested that language determines the way we think. For example, he noted that the Hopi people do not have the past tense for verbs. Therefore, the Hopi cannot think readily about the past.
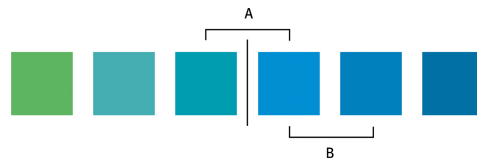

Benjamin Whorf (1897-1941)

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Language Influences Thinking

When a language provides words for objects or events, we can think about these objects more clearly and remember them. It is easier to think about two colors with two different names (A) than colors with the same name (B) (Özgen, 2004).

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Word Power

Increasing word power pays its dividends. It pays for speakers and deaf individuals who learn sign language.

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Linguistic Determinism Questioned

Although people from Papua New Guinea do not use our words for colors and shapes, they still perceive them as we do (Rosch, 1974).

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Thinking in Images

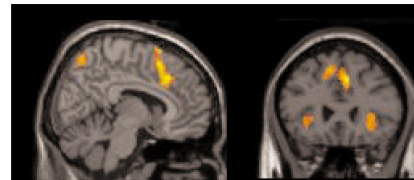To a large extent thinking is language-based. When alone, we may talk to ourselves. However, we also think in images.

We don't think in words, when:
1. When we open the hot water tap.
2. When we are riding our bicycle.

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Images and Brain

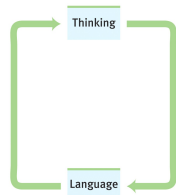Imagining a physical activity activates the same brain regions as when actually performing the activity.

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Language and Thinking

Traffic runs both ways between language and thinking.
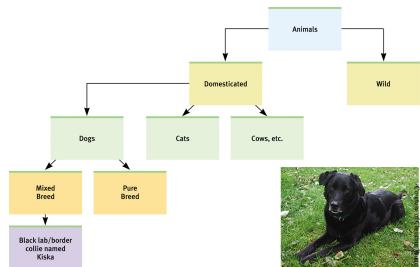
Thinking

Language

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Concept

The mental grouping of similar objects, events, ideas, or people. There are a variety of chairs but their common features define the concept of a *chair*.
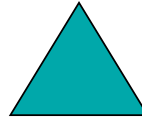

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Category Hierarchies

We organize concepts into category hierarchies.

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Development of Concepts

We form some concepts with definitions. For example, a triangle has three sides. Mostly, we form concepts with mental images or typical examples (prototypes). For example, a robin is a prototype of a bird, but a penguin is not.

Triangle (definition)

Bird (mental image)

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Algorithms

Algorithms, which are very time consuming, exhaust all possibilities before arriving at a solution. Computers use algorithms.

S P L O Y O C H Y G

If we were to unscramble these letters to form a word using an algorithmic approach, we would face 907,208 possibilities.

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Heuristics

Heuristics are simple, thinking strategies that allow us to make judgments and solve problems efficiently. Heuristics are less time consuming, but more error-prone than *algorithms*.

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Heuristics

Heuristics make it easier for us to use simple principles to arrive at solutions to problems.

S P L O Y O C H Y G
S S Y O H O C H G Y

Put a Y at the end, and see if the word begins to make sense.

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Insight

Insight involves a sudden novel realization of a solution to a problem. Humans and animals have insight.
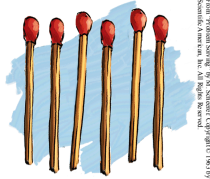

Grande using boxes to obtain food

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Fixation

Fixation: An inability to see a problem from a fresh perspective. This impedes problem solving. Two examples of fixation are *mental set* and *functional fixedness*.

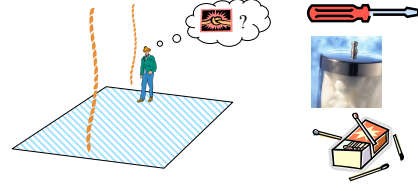The Matchstick Problem: How would you arrange six matches to form four equilateral triangles?

http://www.metacafe.com/watch/621789/
how_do_you_make_4_triangles_with_6_matches/

From "Problem Solving" by M. Scheerer. Copyright © 1963 by Scientific American, Inc. All Rights Reserved
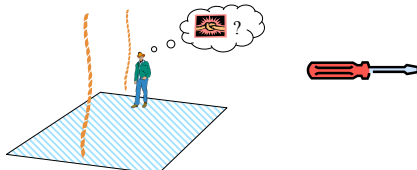

Functional Fixedness

A tendency to think only of the familiar functions of an object.

Problem: Tie the two ropes together.
Use a screw driver, cotton balls and a matchbox.

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Functional Fixedness

Use the screwdriver as a weight, and tie it to the end of one rope. Swing it toward the other rope to tie the knot.

The inability to think of the screwdriver as a weight is functional fixedness.

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Using and Misusing Heuristics

Two kinds of heuristics, representative heuristics and availability heuristics, have been identified by cognitive psychologists.

Amos Tversky   Daniel Kahneman

Courtesy of Genevieve Award, University of Louisville and the Tversky family

Courtesy of Genevieve Award, University of Louisville and Daniel Kahneman

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Representativeness Heuristic

Judging the likelihood of things or objects in terms of how well they seem to represent, or match, a particular prototype.

If you meet a slim, short, man who wears glasses and likes poetry, what do you think his profession would be?

An Ivy league professor or a truck driver?

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Availability Heuristic

Why does our availability heuristic lead us astray?
Whatever increases the ease of retrieving information increases its perceived availability.
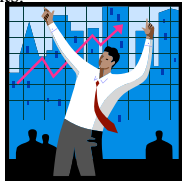
How is retrieval facilitated?
· How recently we have heard about the event.
· How distinct it is.

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Overconfidence

Intuitive heuristics, confirmation of beliefs, and the inclination to explain failures increase our overconfidence. Overconfidence is a tendency to overestimate the accuracy of our beliefs and judgments.

At a stock market, both the seller and the buyer may be confident about their decisions on a stock.

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Exaggerated Fear

The opposite of having overconfidence is having an exaggerated fear about what may happen. Such fears may be unfounded.

The 9/11 attacks led to a decline in air travel due to fear.
Yet, dying in automobile accidents is far more probable than dying in an airplane crash.

AP/Wide World Photos

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