

## GENERAL PSYCHOLOGY (PSYC 210)

### Study Guide: Cognition

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**COGNITION (Thinking; Information-processing): refers to mentally processing information (images, concepts, words, rules, & symbols). What do you do to and with incoming information (n.b. perception).**

--Thinking is the internal representation of a problem or situation. Basic units of thought:

1. images (as in sensory memory)
2. concepts
3. language or symbols (define)

--all three of these are ways of representing information and may be combined in complex thinking

--thinking also involves attention, pattern recognition, memory, decision making, intuition, knowledge, etc.

1. Mental imagery: can be held in memory for about 30 s; eidetic imagery best in childhood (example)

- a. 97% of all people have visual images
- b. 92% have auditory images
- c. Properties of mental images

--mental rotation (example)

--“reverse” vision (stimulus leads to mental representation (example)

--stored image (example: How many uses for a screwdriver?)

--created image (creativity: example)

--kinesthetic imagery (thinking with our bodies; feelings from muscles and joints; “talking” with our hands; most thinking accompanied by micromovements)

2. Concepts: ideas that represent classes of objects or events (e.g., prototypes)

--Concepts allow us to think abstractly

--How is the brain doing this? (categories)

--Concept-formation: the process of classifying information into meaningful categories

a. based on experience with positive and negative instances of concept (especially for children: example)

b. adults often acquire concepts by learning or forming rules (rule-governed learning; rule-governed behavior [as, logic (e.g., If....; then....”)])

--Types of concepts

a. conjunctive concept: “and” concepts (example: motorcycle)

b. relational concepts: classify objects on basis of their relationship to something else or by the relationship between features of an object (example: upside, down; sister)

c. disjunctive concepts: refer to objects that have at least one of several possible features (either-or quality: example, strike, animal)

--What are the rules governing each of our categories?

--Prototypes: ideal models are often used in addition to rules and features to identify concepts (What would you use as a prototype for “mammal”?)

--Connotative meaning: personal meaning

--Denotative meaning: exact definition

### 3. Language

N.B. Thinking can take place without language (e.g., infants, some animals). Thinking without language often based upon images and feelings.

--Language, however, permits the world to be encoded into symbols that are easy to manipulate (discuss).

--study of the meaning of words and language is called *semantics*

--semantics links language and thought [e.g., word order (syntax) changes meaning: example]

--What is a language structure?

a. symbols that can stand for objects and ideas

--the symbols we call *words* are built out of *phonemes* (speech sounds, as, “a” or “d”) and *morphemes* (speech sounds collected into meaningful units such as syllables or words)

b. a language must have a *grammar* or set of rules for making sounds into words and words into sentences

--syntax consists of rules for word order in sentences yielding meaning (e.g., Dog bites man.” not equal to “Man bites dog.”)

--traditional grammar is concerned with “surface” language structure (the sentences that are spoken or written)

--use grammatical rules to create combinations and recombinations of words into sentences [transformational rules/”deep structure” (Noam Chomsky)]

--language is productive [“generative” (Noam Chomsky)] and can be combined and recombined into other meaningful phrases and sentences

### Do animals have language?

- Hayes’ studies: Vicki (chimpanzee) taught to speak but chimps lack muscle apparatus to speak.
- Gardners: taught sign language to Washoe (chimpanzee) who learned 240 signs + 6 word sentences.
- Premack taught Sarah (chimpanzee) with reinforcement techniques using plastic chips as symbols. Sarah was only reinforced for the correct syntax and learned “conditional relationships” (IF, THEN).
- Penny Patterson taught sign language to Koko (gorilla).
- Runbaugh and Savage-Rumbaugh working with Kanzi (chimpanzee) use computer keyboard.
- Are apes simply performing chains of operant responses? This is still controversial.
- Many of these apes achieve the linguistic competence of a 31/2 year old.
- n.b. the problem of syntax.

**Insightful solutions: solutions appear after period of unsuccessful thought [“Ah hah!” (Gestalt Psychology)]**

--Insightful problem-solving involves three abilities

- selective encoding: selecting information relevant to problem while ignoring distractions
- selective combination: bringing together seemingly unrelated bits of useful information
- selective comparison: the ability to compare new problems with old information or with problems already solved

--Barriers to problem-solving

- problem-solving also related to fixations: tendency to get “hung up” or “stuck” on wrong solutions or to become blind to alternatives (e.g., functional fixedness, the inability to see new uses: example)
- emotional barriers (e.g., inhibition, etc.)
- cultural barriers (e.g., gender socialization)
- learned barriers (e.g., familial)
- perceptual barriers (e.g., habits or structure of nervous system)

**Artificial Intelligence (AI): computer programs capable of doing things that require intelligence when done by people**

--a set of rules applied to a body of information

- AI programs better at some tasks than humans
- AI used as a research tool
- ES (expert systems): programs display advanced knowledge of a specific topic or skill
- Computer simulations (CS): programs used to simulate human behavior, especially thinking, decision-making, or problem-solving
  - testing models of cognition: usually based on “means-end” analysis where computer compares current state of affairs to the desired end state or goal
  - program then searches for steps that can be taken to reduce the difference (cycle repeated until problem solved)

**Creative thinking (“divergent thinking” + practical + sensible): What distinguishes creative thinking from more routine problem-solving?**

- Fluency: total # of suggestions you are able to make
- Flexibility: # of times you shift from one class of possible uses to another
- Originality: How novel or unusual suggestions are

**Intuition: quick, impulsive thought that does not make use of clear reasoning (logic)**

--Can lead to three types of mistakes (Tversky & Kahneman)

- Representativeness (example): representativeness heuristic

- Underlying odds (base rule)
- Framing: How is a problem stated? Usually, the broadest way of framing or stating a problem produces the most rational decisions. People usually frame too narrowly.

### **Intelligence**

#### --Definitions

- The global (“g”) capacity to act purposefully, to think rationally, and to deal effectively with the environment.
- Intelligence is what intelligence tests measure.

#### --Aptitude: a capacity for learning certain abilities

- special aptitude tests (predict person’s ability to succeed in a single area)
- multiple aptitude tests measure two or more capacities (as, SAT)
- general intelligence tests test wide variety of mental abilities

--*Reliability* (repeatability/consistency of results) and *validity* (accuracy) of tests/instruments

#### --Test standardization

- standard procedures used in giving test to all people
- finding the norm or average score made by large group of people (I.Q. normally distributed with a mean score of 100 and a standard deviation of 15 points. Thus, the normal range of I.Q. is taken to be 100 plus or minus 15, or 85 – 115.)

--Testing intelligence: initiated in the USA by Lewis Terman (Stanford) (Stanford-Binet Intelligence Scale: MA (mental age) divided by CA (chronological age) X 100= I.Q. Thus, for example, 12 divided by 10 X 100= 120 I.Q.)

--I.Q. scores not stable until about age 6, changes small after middle childhood

--Distribution of I.Q.’s approximates a normal curve

--Sex differences in I.Q. said to be minor, on average, though standard deviation for males greater than standard deviation for females

--Some studies suggest that females excel on verbal skills, especially vocabulary and also rote learning and that males excel in spatial and math skills. See, however,

Hyde, J.S. (2005). The gender similarities hypothesis. *American Psychologist*, 60, 581-592.

#### --I.Q. and Achievement

- correlation (r) between I.Q. and school grades is 0.50 (other factors are significant such as SES, motivation)
- r between I.Q. and job classification: little correlation (e.g., individuals with high I.Q. may have no accomplishments; individuals with low I.Q. may have accomplishments)

--Are there different types of intelligence? Gardner (“multiple intelligences”); Sternberg (“triarchic theory of intelligence”); Goleman (“emotional intelligence”: social skills, not I.Q., determine success)

--Identifying gifted children: characteristics

- tendency to associate with older children and adults
- ability to absorb information rapidly
- early fascination with problem-solving
- early reading

--Mental retardation (I.Q. of 70 or below)

- familial retardation: correlate of poverty
- organic causes of retardation (damage to tissues)
- birth injuries (e.g., deficiency of O<sub>2</sub> at birth)
- fetal damage (maternal use of alcohol or drugs that impair fetus)
- metabolic disorders (PKU: a genetic disease involving lack of an enzyme to break down phenylpyruvic acid in the body; can be controlled by diet)
- genetic abnormalities [e.g., microcephaly, hydrocephaly, cretinism, Down Syndrome (Down Syndrome caused by 3 #21 chromosomes)]. Search these disorders @ [www.google.com](http://www.google.com).

--Is I.Q. inherited?

- Tryon’s classic studies (1920’s) breeding intelligent line of rats. Methodology of this research criticized today; however, studies remain classics in the field of behavioral genetics.
- There is an ongoing concern for the potential social and political abuse of research on intelligence (e.g., “eugenics” movement: selective breeding for desirable characteristics)

--Twin studies (discuss): equivocal results

--Family size: some studies suggest that older children have higher I.Q.’s. Why might this be the case?