What are we going to study?

– Human cognitive processes

• What is it?
  – It is about human cognition
  – = thinking

• Cognitive Psychology
  – = The study of thinking

Thinking

• Let’s list typical examples of thinking

  – Solving a problem in a calculus class.
  – Writing a philosophical essay in a creative writing class
  – Trying to figure out a solution in a chemistry class
  – Figuring out how to fix a car

Examples

• I used to starve myself to fit into my skinny jeans. I thought that thin was everything, and I was losing everything to be thin. For years, anorexia and bulimia stole my hopes and dreams. It almost took my life….. My eating disorder was about low self-esteem, constant self-criticism, and painful, unrelenting perfectionism.

  – Jenni Schaefer is a singer/songwriter, speaker, and the author of Life Without Ed: How One Woman Declared Independence from Her Eating Disorder and How You Can Too. This is an excerpt taken from the website of National Eating Disorders Association
Phobia

- A phobia (from Greek: φόβος, phobos, "fear"), is an irrational, intense, persistent fear of certain situations, activities, things, or persons.
- The main symptom of this disorder is the excessive, unreasonable desire to avoid the feared subject. When the fear is beyond one's control, or if the fear is interfering with daily life, then a diagnosis under one of the anxiety disorders can be made.
  - Wikipedia

Cognitive therapy

- Aaron T. Beck

  - http://www.beckinstitute.org/Library/InfoManage/Guide.ashx?FolderID=200&SessionID={D1EC9939-CD7F-4075-A293-E50ECBB031D9}

Thinking

- http://www.naphill.org/

  - We human beings are the only creatures on earth who have the capacity for belief. ... When you set goals for yourself, make sure they are based on doing the right thing for your family, your friends, your employees, and yourself.
  - When others see that you are fair and just in your dealings with them and that you are a generous, principled person, they will move heaven and earth for you.

  - Some Hindu proverb (from an unknown source)

  - If you change your thinking, you change your attitude.
  - If you change your attitude, you change your action.
  - If you change your action, you change your habit.
  - If you change your habit, you change your personality.
  - If you change your personality, you change your destiny.
  - If you change your destiny, you change your life.

Finally, everything we know of starts with thinking

- Perceiving – how do we see & hear?
- Attending – how do we focus our attention?
- Memory – How do we remember things?
- Knowledge – How do we acquire new knowledge?
- Language – How do we communicate?
- Reason – How do we reason?
- Solving problems – How do we solve problems?
- Decision making – How do we make decisions?
A brief history of cognitive psychology

• “A brief history of Modern Psychology”
  • By Ludy T. Benjamin
  • Presidential Professor of Teaching Excellence, TAMU
  • http://people.tamu.edu/~l-benjamin/

Physiology

• Hermann von Helmholtz (1821-1894)
  – German physician, physicist,
  – Visual perception, physiological psychology

• Wilhelm Maximilian Wund (1832-1920)
  – German psychologist
  – Structuralism

• Gustav Fechner (1801-1889)
  – Trained physicist
  – German experimental psychologist
  – Psychophysics

American Psychology

• G. Stanley Hall (1844-1924)
• William James (1842-1910)
• James McKeen Cattell (1860-1944)

Wund

• The goal of psychology → discover
  “the facts of consciousness”

• How do you study consciousness?
  – Every conscious experience consists of
    • the content of the experience and
    • the process that makes the content available to the
      experiencing individual.

• His psychology is about studying this
  process and is called structuralism.

How did he do that?

• Identify all basic components of
  consciousness (e.g., sensation)

• examine the way they are organized.

• This approach is called “Structuralism”
Structuralism (continued)

• Structuralism is about identifying the structure of consciousness by
  – 1. finding its basic elements
  – 2. figuring out how they are organized
  – 3. understanding why they are organized in a particular manner given a conscious experience.

Method: Introspection

• Experimental self-observation (Introspection)
• Attention to the phenomenon and making a record of the phenomenon.
  – Train an observer
  – The observer is presented with some stimulus briefly (e.g., presenting a series of sounds one by one)
  – The observer gives an account of his / her mental experience

Functionalism

• Wund’s students
  – G. Stanley Hall
    • Studied philosophy with W. James at Harvard
    • Went to Leipzig in Germany and attended some lectures by Wund
    • Later established the first psychology laboratory at Johns Hopkins
  – McKeen Cattelle
    • The first doctoral student of psychology
    • Founded laboratories at Univ. of Pennsylvania and at Columbia.

Functionalism

• try to understand the utility of consciousness
  – What is it for?
  – How did it come to be?
    • How come we have “consciousness” in the way we have now?
• Individual differences, and what create differences

• Functionalist psychology
  – Measured individual differences
    • intelligence, IQ tests, child development, sex differences, personality, motivation,…
  – Studied practical applications
    • Learning, abnormal behavior, business psychology, educational psychology,…

Structuralism vs. Functionalism

• S: What are the basic elements of consciousness and how are they organized / structured?
• F: What leads people to feel and act in the way they do?

Example

• Learning:
  – Structuralism:
    • Identify the basic elements underlying human learning, and how they are organized (how do the mental processes of learning work?).
  – Functionalism:
    • Find out why person A is a better learner than person B.
Behaviorism

- The antithesis of structuralism

- Structuralism
  - Method → self-observation, introspection

Behaviorism (1920’s-1950’s)

- Focus on
  - The relation between observable behavior and environmental events / stimuli
- Learning is to establish
  - Associations between stimuli and responses

Where did this idea come from?

- Ivan Pavlov (1849-1936)
- Classical conditioning
  - Food → salivate
  - Food + bell → salivate
  - Bell → salivate

http://www.youtube.com/watch?v=hhqumfpxuzI&feature=related

Radical Behaviorism

- All forms of human behavior can be explained by a process that links a stimulus and a response.
- Skinner’s operant conditioning
  - Rewards and punishments as we encounter in the environment shape our behavior.
- Skinner box (0:51)
  - http://www.youtube.com/watch?v=PQtDTdDr8vs

What’s wrong with this idea?

- Is learning all about forming stimulus-response associations?

Emergence of Cognitive Psychology

- The antithesis of behaviorism
• Noam Chomsky’s Language Acquisition Device (LAD)
  How do children acquire language?

  – Behaviorist:
    • Imitate adults and establish stimulus and response connections.
    • “Dog” →

  Noam Chomsky’s criticism

  Productivity and systematicity of language
  • Children can produce new sentences they have never heard before.
  • Almost anyone can produce an infinite number of sentences.
  • http://www.chomsky.info/

Guinness Book of World Records:

• The longest English sentence ever written: 1300 words in William Faulkner’s novel “Absalom, Absalom!”
  – “They both bore it as though deliberate flagellant exaltation…..”
  – Faulkner wrote, “They both bore it as though deliberate flagellant exaltation…..”
  – Takashi said that Faulkner wrote, “They both bore it as though deliberate flagellant exaltation…..”
  – John said, who cares Takashi said that Faulkner wrote, “They both bore it as though deliberate flagellant exaltation…..”

(Taken from S. Pinker’s “Language Instinct”)

• LAD (Language acquisition device)
  – Language learning is not just linking a stimulus and a response, but
  – there should be some internal structure geared for the acquisition of language.

Behaviorism vs. cognitivism

  Behaviorism

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<th>Stimuli</th>
<th>Responses</th>
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  Cognitivism

<table>
<thead>
<tr>
<th>Stimuli</th>
<th>Brain</th>
<th>Responses</th>
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Cognitive Revolution

• The development of the computer
  – Information processing and the Universal Turing machine
• AI (artificial intelligence)
  – H. Simon and Newell’s Physical Symbol Hypothesis
• Neural science
  – Neural network, cognitive neuroscience and brain imaging
• Linguistics
  – Noam Chomsky’s Universal Grammar
• Information theory
  – Shannon’s information theory
A major assumption in cognitive psychology

- **Information processing**
  - Cognition as computation