

Psychology 105

Chapter 1

Research in Psychology

Spring 2008

Research in Psychology

- Questions of Psychology
- An experiment
- DVD: The Many Faces of Psychology
- Psychology as a Science
 - Objectives of Science
 - The Scientific Method
 - Types of Research in Psychology
 - Levels and Forms of Analysis
 - Simple Data Analysis
 - Ethical Issues in Psychological Research
- Supplementary Slides - Very Brief History of Psychology

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Great Questions of Psychology - 1

The great questions of psychology (and philosophy) were addressed during the Golden Age of Athens (4th-5th C. BCE), and onward into the present:

- Mind vs. Body - are they separate, distinct entities or the same substance?
- Is human nature the product of innate tendencies, or of experience and upbringing (AKA nature vs. nurture, genes vs. environment)?

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Great Questions of Psychology -2

- How do we know what we know? Are ideas built into our minds (nativism), can we derive them from first principles (rationalism), or do we develop them from perceptions and experience (empiricism)?
- Does reason rule the emotions, or vice-versa?
- **Critical realization: the recognition that humans can examine, comprehend, guide, control their own thoughts and emotions**

Smaller questions in Psychology-1

- **But nonetheless important:**
 - Why do some people commit crimes, and others do not?
 - Is punishment harmful in raising a child?
 - What happens when you "fall in love"?
 - How and why are some people homosexual or trans-gendered? Genes, environment, or experience?
 - What is "intelligence," how and why do people differ in it, and is it determined by heredity or environment and experience?
 - How do people learn a language? A second language?

Smaller questions in Psychology -2

- Why do some people abuse their children, and what are the long-term effects of child abuse?
- What are the "best practices" for raising a child?
- What causes mental disorders like depression, schizophrenia, anxiety?
- What drives some people to become pedophiles? Can pedophilia be cured?
- Why do women who are abused often stay with their husbands?
- What is the best way to study for an exam?
- Do animals think and experience emotion?
- Why do people sometimes behave differently around other people than when they are alone?
- And your questions are ... ?

Words Experiment

→ **Words appear here** ←

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The Words

This slide will be uncovered after the in-class experiment has been completed.

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Research in Psychology: Objectives of Science

- **Describe**
 - Observations vs. inferences
 - Pink dots: did you report any inferences?
- **Explain**
 - Inference
 - Purpose of theories
- **Predict**
- **Control**
 - Help gain mastery and control over own lives
 - Includes control over variables

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The Science of Psychology

How do psychologists make discoveries and develop new knowledge?

- Psychologists use the *scientific method* to test their ideas *empirically*.
- **Scientific method:** A method of inquiry and discovery that relies on careful *observation*, testing of *hypotheses*, and *empirical*, experimental methods that are designed to *eliminate bias*.
 - Same method used by other sciences - chemistry, biology, physics, ...
- A useful theory can be **refuted**
 - By accumulation of failed predictions, counterexamples
 - By newer theories that do a better job of explaining data
 - A theory that cannot be refuted is not scientifically useful or valid

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Why use a Scientific Method?

- **Common sense isn't enough - often biased, uncritical**
- **Some sources of bias in "common" thought**
 - Seeing cause and effect between events that occur together
 - Perceiving order in random events
 - Generalizing from limited data
 - Confirmation bias: Paying attention to things that confirm our beliefs, ignoring or distrusting things that contradict them

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- **Sources of bias in common thought, continued...**
 - Hindsight Bias: After an outcome, claiming we knew it all along
 - False consensus effect: Overestimating agreement of others
 - Framing questions and selecting data so as to favor a particular outcome
 - "Vivid Cases": Anecdotes that stand out, seem to confirm a belief
- **The Scientific Method is used to overcome the effects of "common sense" and bias in order to discover information and relationships among events and to make predictions about unknown events.**

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This slide will be uncovered after the class meets

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Five Steps of the Scientific Method

1. **Develop a research question**, from theory, observation, experience, or even common beliefs
2. Form an *hypothesis* about the outcome as a **specific prediction**
3. **Gather evidence** as objective data
 - *Controlled test*
4. **Draw conclusions**: Analyze the results and determine whether the data support the hypothesis
5. **Publish, criticize and replicate the results**

Good science is public; each step of the process is open to critical examination

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What is a Variable?

- **Variable**: takes on more than one value - it **VARIES**
- **Examples**
 - Height
 - Weight
 - Score on an exam
 - Gender (male or female)
 - Hours slept last night
 - Hours since last meal
 - Number of words correctly recalled
 - Dose of a drug
 - Instructions given in the experiment

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Five Types of Psychological Studies

1. Case Studies -	}	Description
2. Naturalistic Observation -		
3. Survey -		
4. Correlational Study -		Relationships between variables
<ul style="list-style-type: none"> ▪ "Correlation does not imply causation." 		
➤ Experiment -		"Cause and Effect"

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Components of an experiment

- **Experiment:** *only type of study that directly examines cause and effect*
- **Hypothesis:** *prediction of results based on theory or observation (a low dose of caffeine just before taking an exam will improve performance)*
- **At least two groups or conditions**
- **Typical (effects of caffeine on test performance):**
 - **Experimental group** - experiences condition of interest (*gets 10 mg of caffeine in a pill*)
 - **Control group** - experiences everything the same except condition of interest (*gets no caffeine in a pill*)
 - **Independent variable** - variable **controlled**, changed or manipulated by the experimenter; what the experimenter manipulates (*amount of caffeine - 10 mg or 0 mg*)
 - **Dependent variable** - variable **measured** by experimenter; the data, what the participants did (*test scores after taking pill*)
"The dependent variable depends on the independent variable."

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Handling Bias in Experiments

Bias: *the tendency to frame questions, select data or interpret results in a way that tends to favor one outcome over another.*

Some ways to avoid bias:

- **Randomization:** *every individual has an equal chance of being assigned to a condition or group*
- **Control Group:** *experiences same conditions as experimental group, with exception of variable of interest*
- **Double-blind study:** *Neither experimenter nor participant knows what the treatment is, until after the experiment is done*

Placebo effect: *positive outcome based on participant's expectation*

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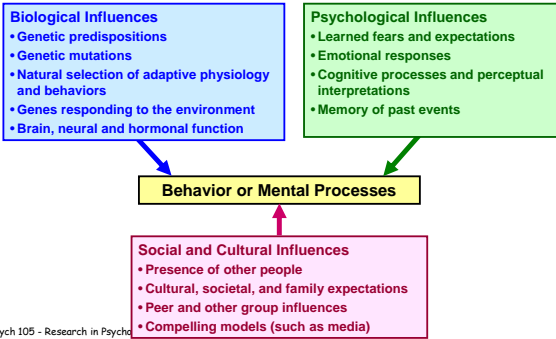
Example - Hypothesis: watching violent cartoons makes children behave aggressively

How would you examine this hypothesis using an experiment?

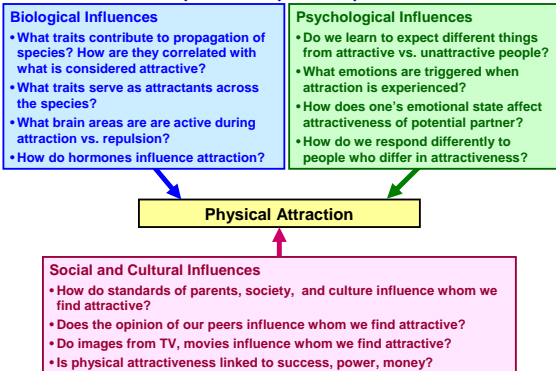
- Assign children to groups - how?
- Independent variable:
 - experimental, control group (to what conditions are they exposed?)
- Dependent variable: what and how measured?

Levels of Analysis

Levels of Analysis: different ways of looking at how behaviors or mental processes are influenced; complementary analyses.



Levels of Analysis Example: Physical Attraction



Analyzing Psychological Data Overview

- Describing the data: Descriptive statistics
 - What is a typical score?: mean, median, mode (*central tendency*)
 - How much do the scores differ from each other? (*variability*)
 - Graph: frequency distribution
 - What is the strength of relationship between two variables? (*Correlation coefficient*)
 - Graph: scatterplot
- Drawing inferences from the data: Inferential statistics

Some Descriptive Stats: "typical" scores

Measures of Central Tendency - what is a "typical" score?

- **Mode:** Most frequently occurring score
- **Median:** Score that divides the distribution: half above it, half below it
- **Mean:** Average score - sum of all scores divided by number of scores

Subject	Score
Helen	6
Faye	9
Ellen	10
Barry	12
Isobel	13
Cheryl	14
David	14
Jack	14
Kevin	16
Garry	17

Mean = 12.5
Median = 13.5
Mode = 14

Total = 125
Mean = 125/10 = 12.5

Some Descriptive Stats: Variability

Measures of Variability: how much do scores differ from each other and from the central tendency?

- **Range:** difference between highest and lowest score
- **Standard deviation:** one measure of the average difference between each score and the mean

Subject	Score
Helen	6
Faye	9
Ellen	10
Barry	12
Isobel	13
Cheryl	14
David	14
Jack	14
Kevin	16
Garry	17

Mean = 12.5
Standard Deviation = 3.34
Range = 17-6 = 11

Summarizing data: Frequency Distribution

Frequency Distribution – how frequently each score or range of scores in a data set occurs

Raw Data

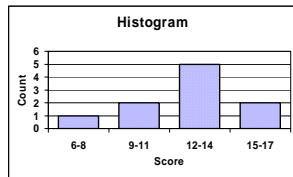
Subject	Score
Barry	12
Cheryl	14
David	14
Ellen	10
Faye	9
Garry	17
Helen	6
Isobel	13
Jack	14
Kevin	16

Sorted Data

Subject	Score
Helen	6
Faye	9
Ellen	10
Barry	12
Isobel	13
Cheryl	14
David	14
Jack	14
Kevin	16
Garry	17

Frequency Distribution

Score	Count
6-8	1
9-11	2
12-14	5
15-17	2



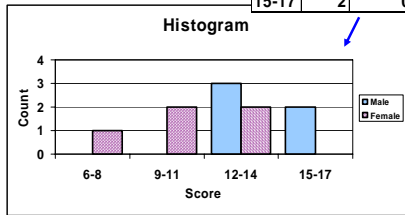
Summarizing Data: Frequency Distribution, cont.

➤ Two frequency distributions:

Sorted Data

Subject	Score
Helen	6
Faye	9
Ellen	10
Barry	12
Isobel	13
Cheryl	14
David	14
Jack	14
Kevin	16
Garry	17

Score	Male	Female
6-8	0	1
9-11	0	2
12-14	3	2
15-17	2	0



Correlational Research

Correlational study: looks for relationship between two variables; Knowing one, how well can you predict the other?

*Knowing weight, how well can you predict height?
Knowing mother's IQ, how well can you predict child's IQ?*

Correlation coefficient – a measure of the strength of the relationship between two variables

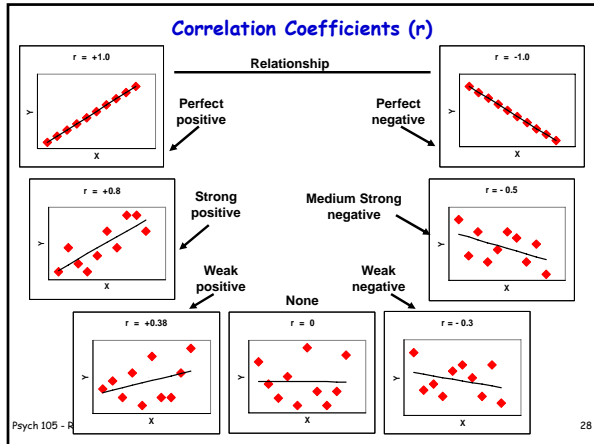
➤ **Varies between -1 and +1**

- Cannot be less than -1; cannot be greater than +1

➤ **Size** (absolute value) is an indication of how predictable one variable is when you know the value of the other one

- Zero → no relationship between variables – no prediction possible
- +1 → perfect positive relationship between variables – if you know one, you know the other (perfect prediction)
- -1 → perfect negative relationship between variables – perfect prediction
- +0.5 or -0.5 → pretty good prediction, but not perfect

➤ **Direction** (positive or negative) shows the type of relationship



Correlation vs cause

A correlation coefficient is a measure of the *strength of the relationship between two variables*

Burn this into your brain:

The presence of a strong correlation does NOT mean that one variable caused the other:

CORRELATION DOES NOT IMPLY CAUSATION

The Directionality Problem
The Third Variable Problem

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Example: Correlation vs. Cause

Does feminism cause environmental pollution?

Does environmental pollution cause feminism?

These charts: <http://snipurl.com/rdng>
Gapminder web site: <http://tools.google.com/gapminder>

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So your groups differ...

- ... or your correlation is really high...
- Are the results real, or could they have happened by chance?
- Are the results important?

Inferential Statistics

- Are the results real?
 - You could have gotten the same results, the same size differences, by chance or random error
 - Results are likely to be real (*statistically significant*) when...
 - Groups are large (data is more representative)
 - Variability within each group is small relative to differences between groups
 - Data were gathered without bias (randomization used, in selecting cases, reporting, or analyzing data)

Significant vs. Meaningful

- "*Statistically Significant*" means that you're unlikely to obtain the result by chance or random error
- "*Meaningful*" means that the result is large enough or important enough for anyone to care

Ethical Issues in Psychological Research

- **Deception in human research**
 - Avoid harming or unduly distressing the participants
 - Debrief participants when research is done
- **Use of animals in research**
 - Maintain in healthy conditions
 - Minimize discomfort
 - Weigh discomfort against potential benefits

**Chaos, panic & disorder ---
my work here is done.**

**Supplementary Slides:
A Very Brief History of Psychology**

History of Psychology

- *Psychology: The science of behavior and mental processes ("mind")*
- First documented psychological study done by Psamtik I, an Egyptian ruler, 7th century BCE
 - Question: what is the native language of the first humans?
 - Hypothesis: Children who never hear spoken language will speak the native language of 1st humans

History of Psychology

- No evidence that early peoples had awareness of and ability to observe and control mental processes:
 - "Thoughts:" voices of spirits or the Gods.
 - "Behaviors:" directions from the Gods
- Early awareness of one's mental processes and control of them seen starting around 6th Century BCE
 - Siddhartha Guatama (the Buddha)
 - Confucius
- Philosophers concerned with many questions later taken on by psychologists

Psychology Becomes a Science

Structuralism: Wundt (1832-1920), Titchener

What is the structure of the mind, and what are its elements?

- Wilhelm Wundt: first psychology laboratory at the University of Leipzig (1879)
- Used reaction time and introspection (looking in) to explore the elemental structure of the human mind



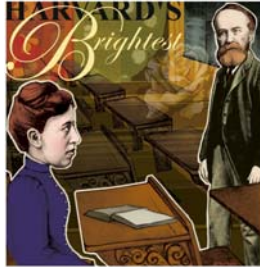
Wundt (left)

Psychology Becomes a Science

Functionalism: James (1842-1910), Dewey (1859-1952) and Calkins

Functionalism: influenced by Darwin and theory of evolution

- How do behavioral and mental processes function to support the organism?
- How do they enable organism to adapt, survive, and flourish?



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Calkins and James

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Psychology Becomes a Science

Gestalt Psychology: First publications ca. 1910

Gestalt Psychologists:

- objected to the atomistic approach of the structuralists
- claimed that mind and behavior are more than the sum of their parts
- research focused on sensory systems and illusions.



Wertheimer



Kohler



Koffka

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Psychology Becomes a Science

Behaviorism and the Learning Theorists

Pavlov - classical conditioning

Thorndike - respondent learning in cats

Watson - founded "school" of Behaviorism

Skinner - characterized behavior by consequences

Behaviorism:

- "Mind," has no place in psychological research.
- Psychology is the science of observables, the study of behavior.
- Dominated US psychology during 1st half of 20th century



Thorndike



Pavlov



Watson



Skinner

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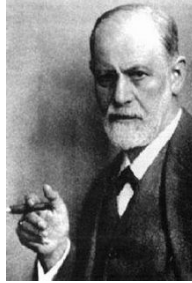
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And Psychology Proceeds without Science

Psychoanalysis: Sigmund Freud (1856-1939)

Freud: founded Psychoanalysis

- Focused on the origins, development, and treatment of abnormal behavior and psychological maladjustment
- Proposed that unconscious memories, impulses, and drives underlie much of a person's behavior and mental functioning.
- Responsible for making the concept of the Unconscious central to much psychological thinking.
- Proposed that very early childhood experiences determined the course of a persons life.
- Highly influential theory, but many aspects lack scientific support



Sigmund Freud

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