UNIT 2
research methods & the scientific study of psychology

THE NEED FOR PSYCHOLOGICAL SCIENCE

"the real purpose of the scientific method is to make sure Nature hasn't mislead you into thinking you know something you actually don't know."

DID WE KNOW IT ALL ALONG? – HINDSIGHT BIAS

hindsight bias = the tendency to believe, after learning an outcome, that one would have forseen it
- "I knew it all along"
- "out of sight, out of mind"
- "absence makes the heart grow fonder"

OVERCONFIDENCE

✦ the tendency to believe we know more than we actually do

✦ trusting our intuition = memory of the past that is stimulated in us by something in the present

✦ overconfidence in the accuracy of our knowledge
- hindsight bias and overconfidence lead us to over-estimate our intuition
- scientific inquiry helps sift reality from illusion

THE SCIENTIFIC ATTITUDE

THREE MAIN COMPONENTS:

✦ curious eagerness

✦ skeptically scrutinize competing ideas

✦ open-minded humility before nature

CRITICAL THINKING

✦ "smart thinking"

✦ four elements
  - ✦ examines assumptions
  - ✦ discerns hidden values
  - ✦ evaluates evidence
  - ✦ assesses conclusions

the scientific method

- **THEORY**

  "mere hunch" that integrates a set of principles that organizes observations + predicts behaviors or events

- **HYPOTHESIS**

  a testable prediction, implied by theory, that can be confirmed or refuted

- **OPERATIONAL DEFINITION**

  statement of the exact procedure used in a research study

- **REPLICATION**

  repeating the essence of a research study to see if results can be generalized to other participants / circumstances

(1) Theories
Example: Low self-esteem feeds depression.

confirm, reject, or revise

lead to

(3) Research and observations
Example: Administer tests of self-esteem and depression. See if a low score on one predicts a high score on the other.

(2) Hypotheses
Example: People with low self-esteem will score higher on a depression scale.

lead to

○ **A GOOD THEORY IS USEFUL IF IT:**
- effectively organizes a range of self-reports and observations
- implies clear predictions that anyone can use to check the theory

○ **3 TYPES OF METHODS TO TEST THEORY:**
- descriptive
- correlational
- experimentation

DESCRIPTION

THE CASE STUDY
- examines one individual in depth

- suggest further study

- cannot discern general truths
- the plural of anecdote IS NOT evidence

THE SURVEY
- looks at many cases at once

- word effects can affect opinions

- random sampling
  - representative sample
  - balances the influence of vivid cases or anecdotes
  ↳ population random sample
    ↳ account for the things that being in one place can't do for you

NATURALISTIC OBSERVATION
- describes behavior
- does not explain behavior in an empirical way (no measurement /evidence)

speaks toward critical thinking

CORRELATION

= a measure of the extent to which two factors vary together, and thus of how well either factor predicts the other
  ↳ How well does A predict B
  ↳ positive vs. negative correlation

- **CORRELATION COEFFICIENT**
  = a statistical index of the relationship between 2 things
    ✦ strength of the correlation (-1 to +1)
    ✦ scatterplot
- correlation helps predict but does not imply cause & effect
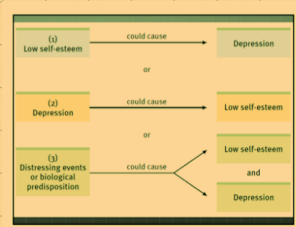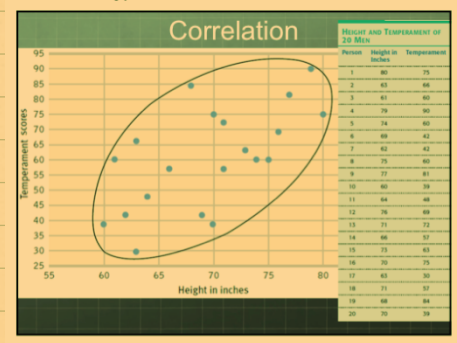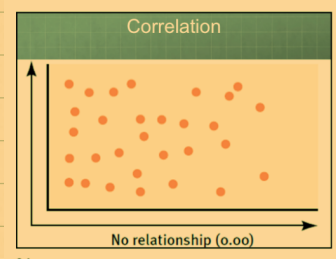- [EXAMPLE] = depression + self-esteem are correlated
- **ILLUSORY CORRELATIONS**
  ✦ perceived non-existant correlation
  ✦ a random coincidence based upon a focus on "con-forming evidence" only
- **PERCEIVING ORDER IN RANDOM EVENTS**
  ✦ comes from our need to make sense out of world
    ↳ (i.e. coin flip, poker hand)

CORRELATION IS NOT CAUSATION

EXPERIMENTATION

RANDOM ASSIGNMENT
- eliminates alt. explanations
- diff. from random samples
- blind (uninformed)
  - single-blind procedure (subjects)
  - double-blind procedure (researchers)
- placebo effect
- experimental group

EXPERIMENT:
- can isolate cause & effect
- control factors
  - manipulation of the factor(s) of interest
  - hold constant (controlling) factors
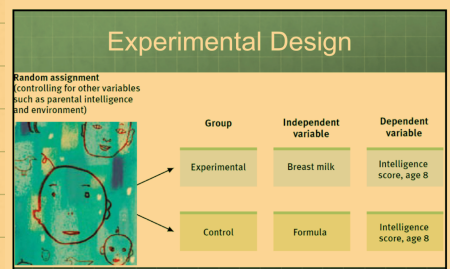
INDEPENDENT AND DEPENDENT VARIABLES

- receives the treatment (independent v.)
- **control group**
  - does not receive the treatment

- **independent variable** : Confounding variable
  - ↳ effect of random assignment on confounding variables
- **dependent variable**
  - ↳ what is being measured

PLACEBO EFFECT

when an improvement of symptoms is observed, despite using a nonactive treatment. occurs during factors like expectations + classical conditioning and can ease pain or fatigue

a phenomenon in which some people experience a benefit after the admin. of an inactive "look-alike" substance or treatment.
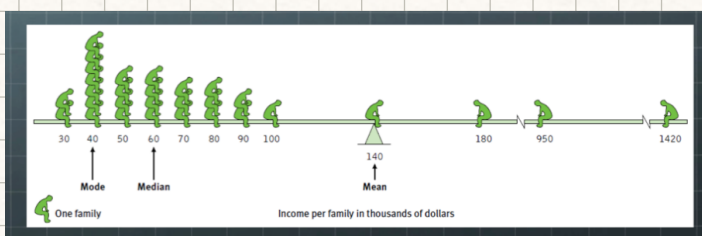
specifically used in control groups and experimentation

2 Types of placebos:

- pure or inactive placebos, such as sugar pills or saline injections

- impure or active placebos, such as prescribing an antibiotic for a viral infection or a vitamin even though the patient doesn't need it.
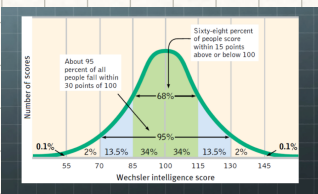
DESCRIBING DATA
- mode (occurs the most)
- mean (arithmetic average)
- median (middle score)

↳ measure of variability
- normal curve (bell shaped)

About 95 percent of all people fall within 30 points of 100

Sixty-eight percent of people score within 15 points above or below 100

68%

95%

0.1%   2% 13.5% 34% 34% 13.5% 2%   0.1%
55   70   85   100 115   130   145
Wechsler intelligence score

Number of scores

30 40 50 60 70 80 90 100   180   950   1420
              Mode   Median   140
                                   Mean
One family   Income per family in thousands of dollars

- positive skew
  - long tail is on the positive side
  - median is to the right of the median + mode or
 - some say the distribution is "skewed to the right"

Comparing Research Methods

COMPARING RESEARCH METHODS					
Research Method	Basic Purpose	How Conducted	What Is Manipulated	Strengths	Weaknesses
Descriptive	To observe and record behavior	Case studies, surveys, or naturalistic observations	Nothing	Case studies require only one participant; surveys may be done fairly quickly and inexpensively (compared to experiments); naturalistic observations may be done when it is not ethical to manipulate variables.	No control of variables; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Compute statistical association, sometimes among survey responses	Nothing	Works with large groups of data, and may be used in situations where an experiment would not be ethical or possible	Does not specify cause and effect
Experimental	To explore cause and effect	Manipulate one or more factors; use random assignment	The independent variable(s)	Specifies cause and effect, and variables are controlled	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

INFERENTIAL STATISTICS
- trying to reach conclusions that extend beyond just describing the data
- used to test hypothesis about samples

50
40
30
20
10
0
10 20 30 40 50 60

— negative skew
  • long tail is on the negative side
  • mean is to the left of the median or mode or
  • some say the distribution is "skewed to the left"
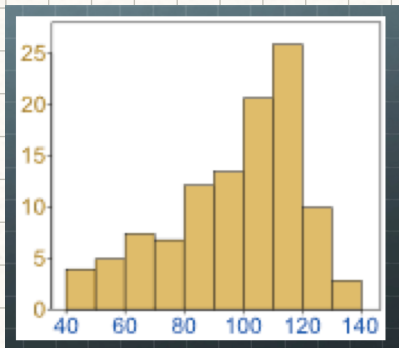
— range
— standard deviation = a computed measure of how much scores vary around the mean score

$$standard\ deviation = \sqrt{\frac{sum\ of\ (deviations)^2}{number\ of\ scores}}$$

CONFIDENCE LEVEL & INTERVALS
▢ confidence interval: in statistics, a confidence interval is a particular kind of interval estimate of a population parameter. Instead of estimating the parameter by a single value, an interval likely to include the parameter is given [ex: 40 ± 2 or 40 ± 5%]
▢ confidence level: aka confidence coefficient, represents the possibility that the confidence interval is to contain the parameter [ex: 95% confidence level]
▢ population size: in statistics, population is the entire entities concerning which statistical inferences are to be drawn. The population size is the total # of the entire entities.

  when is an observed difference reliable?
  ▢ representative samples > biased samples
  ▢ less-variable observations ⇒ more reliable than more variable
  ▢ more cases > fewer cases
  • TESTING FOR DIFFERENCES
  If we have results (means) from 2 groups, before we infer causation we must ask the question:

  is there a real difference between the means of 2 groups or did it happen by chance?

  * to answer this question we must run a "T-test"

MAKING INFERENCES FROM DATA
↳ research goal:
  ▢ to make a statistical statement of how frequently an obtained result occured by experimental manipulation or by chance

when is a difference significant?
▢ statistical significance is a statistical statement of how likely it is that an obtained result occurred by chance.
  • the averages are reliable
  • the differences between averages is relatively large
  • does imply the importance of the results
▢ when sample averages are reliable and the difference between them is relatively large, we say the diff. has statistical significance. It is probably not due to chance variation. (for psychologists, this difference is measured thru alpha level is set @ 5% [α = p > .05])

ILLUSION OF CONTROL
↳ that chance events are subject to personal control is an illusion of control fed by:
1. illusory correlation: the perception of a relationship where no relationship actually exists
2. regression toward the mean: the tendency for extremes of unusual scores/events to regress toward the average

ETHICS IN RESEARCH
▢ ethics in animal research
  • reasons for using animals in research
  • safeguards for animal use
▢ ethics in human research
  • informed consent
  • protected from harm + discomfort
  • maintain confidentiality
  • debriefing