Research

Psychological Science
Research Methods
Ethics
Statistics

Psychological Science

- Critical Thinking
- Theory
- Hypothesis
- Operational Definitions
- Replication

Psychological Science

- **Critical Thinking**
  - Thinking that does not blindly accept arguments and conclusions
  - Examines assumptions and evaluates evidence to develop valid conclusions

Psychological Science

- **Theory**
  - Integrated set of principles that explains, organizes, and predicts behaviors or events

Psychological Science

- **Hypothesis**
  - Testable prediction of the relationship between variables
  - Must be falsifiable

Psychological Science

- **Operational Definitions**
  - Statements about the procedures or operations used to define research variables

Psychological Science

- **Replication**
  - Repeating a research study
  - Often uses different participants in different situations to see if the basic findings extend to different people and circumstances

Research Methods

- Naturalistic Observation
- Case Study
- Survey
- Correlational Study
- Longitudinal Study
- Cross-Sectional Study
- Experiment
- Quasi-Experiment

Research Methods

- **Naturalistic Observation**
  - Observing and recording behavior in naturally occurring situations without manipulating or controlling the situation
  - Overt or Covert

Research Methods

- **Naturalistic Observation**
  - <u>Advantages:</u>
    - Allows us to describe behavior
    - We can examine behaviors that are more typical/normal because they are not manipulated
    - Can provide data that assists in further research (ideas for hypotheses, correlational data)
    - Results are widely generalizable
  - <u>Disadvantages:</u>
    - Cannot explain behavior/no cause & effect conclusions

Research Methods

- **Case Study**
  - Observation technique in which one person is studied in depth in order to reveal universal principles
  - Can also apply to a group of people studied as one entity or community

Research Methods

- **Case Study**
  - <u>Advantages:</u>
    - Information is in-depth and detailed
    - Provides an opportunity to study unusual cases
    - Can provide ideas for hypotheses and further research
    - Could be more ethical if topic studied cannot be ethically studied with an experiment

Research Methods

- **Case Study**
  - <u>Disadvantages:</u>
    - Cannot show cause & effect
    - May not be able to generalize conclusions because sample size is so small or the person might not be typical
    - Inaccurate reporting of information could bias results
    - Could be costly or time-consuming to collect data

Research Methods

- **Survey**
  - Using questionnaires administered to a random sample in order to ascertain the self-reported attitudes or behaviors of a group
  - Could be administered verbally or as a paper questionnaire
  - <u>False Consensus Effect</u>: tendency for a person to think his/her own views are representative of a general consensus

Research Methods

- **Survey**
  - <u>Population</u>: all the cases in a group being studied, from which samples may be drawn
  - <u>Sample</u>: subset of the population
  - <u>Random Sample/Random Selection</u>: sample that fairly represents a population because each member has an equal chance of inclusion

Research Methods

- **Survey**
  - <u>Advantages:</u>
    - Quick and easy to administer & analyze
    - Provides information on many individuals

Research Methods

- **Survey**
  - <u>Disadvantages:</u>
    - Wording effects can influence responses given
    - Survey questions can be superficial, and there is no follow-up to expand on/explain survey answers
    - <u>Nonresponse Bias</u>: individuals who choose to respond to a survey are different from individuals who choose not to
    - <u>Social Desirability Bias</u>: tendency of respondents to reply in a manner that will be viewed favorably by others

Research Methods

- **Correlational Study**
  - Study which measures the extent to which two factors are related to each other and how well one factor predicts the other
  - <u>Correlation Coefficient</u>: statistical index of the relationship between two things (from -1 to 1)
  - <u>Scatterplot</u>: graphed cluster of dots representing values of two variables
    - slope suggests the direction of the relationship between the two variables
    - amount of scatter suggests the correlation strength

Research Methods

- **Correlational Study**
  - <u>Advantages:</u>
    - Enables predictions
    - Can be time-efficient and inexpensive, especially if using previously collected survey data
    - Can be used to dispel illusory correlations
    - Can be more ethical than experiments studying the same topics

Research Methods

- **Correlational Study**
  - <u>Disadvantages:</u>
    - Cannot show cause & effect because direction of relationship is unknown
    - Cannot assess the impact of other factors (third variables, lurking variables)
    - Illusory correlations could give the impression of a relationship where none exists

Research Methods

- **Longitudinal Study**
  - Research method in which the same people are restudied and retested over a long period of time

Research Methods

- **Longitudinal Study**
  - <u>Advantages</u>:
    - differences observed in people are less likely to be the result of cultural differences across generations (compared with cross-sectional studies)
  - <u>Disadvantages</u>:
    - Cannot infer cause & effect
    - Participants who drop out can skew results
    - Very time-consuming
    - Can be costly

Research Methods

- **Cross-Sectional Study**
  - research method that involves observation of people of different ages in order to compare them

Research Methods

- **Cross-Sectional Study**
  - <u>Advantages:</u>
    - Not time-consuming like longitudinal study
  - <u>Disadvantages:</u>
    - Cannot establish cause & effect
    - Differences in age groups could also be a result of cultural differences between generations

Research Methods

- **Experiment**
  - Research method in which an investigator manipulates one or more factors to observe the effect on some behavior or mental process
  - <u>Laboratory Experiment</u>: experiment done in an environment controlled by the researcher
  - <u>Field Experiment</u>: experiment done in a natural setting

Research Methods

- **Experiment**
  - <u>Independent Variable</u>: experimental factor that is manipulated; the variable whose effect is studied; the treatment
  - <u>Dependent Variable</u>: the outcome factor; that variable that may change in response to manipulations of the independent variable

Research Methods

- **Experiment**
  - <u>Experimental Condition/Group</u>: in an experiment, the group that is exposed to the treatment or the independent variable
  - <u>Control Condition/Group</u>: in an experiment, the group that is NOT exposed to the treatment; serves as a comparison against the experimental group to evaluate the effect of the treatment

Research Methods

- **Experiment**
  - <u>Confounding Variables</u>: factor other than the independent variable which may cause a change in the dependent variable
    - <u>Experimenter Bias/Experimenter Expectancy Effect</u>: researcher's expectations or preferences about an outcome of a study influence the results
    - <u>Participant Bias/Demand Characteristics</u>: participants may act in ways they believe the researcher is looking for and so not naturally

Research Methods

- **Experiment**
  - Confounding Variables
    - <u>Placebo</u>: a substance or condition a participant accepts as medicine or therapy, but which has no specific therapeutic activity
    - <u>Placebo Effect</u>: experimental results caused by expectations alone
    - <u>Hawthorne Effect</u>: tendency of research subjects to act atypically as a result of their awareness of being studied, as opposed to any actual treatment that has occurred

Research Methods

- **Experiment**
  - Eliminating Confounding Variables
    - Single-Blind Procedure: research design in which the participants don't know which group (experimental or control) they are in
    - Double-Blind Procedure: research design in which neither the experimenter nor the participants know who is in which group
    - Random Assignment: division of the sample into groups so that each individual has an equal chance of being put into the experimental or control conditions

Research Methods

- **Experiment**
  - <u>Between-Subjects Design</u>: participants in the experimental group and the control group are different individuals
  - <u>Within-Subjects Design</u>: each participant in an experiment acts as his own control comparison

Research Methods

- **Experiment** (Laboratory)
  - <u>Advantages:</u>
    - Very clear evidence for cause & effect relationship
  - <u>Disadvantages:</u>
    - Some lab experiments can be so contrived/ unnatural, that findings aren't as easy to generalize outside of that situation
    - Can be difficult to control all variables

Research Methods

- **Experiment** (Field)
  - <u>Advantages:</u>
    - Can find cause & effect relationships
    - Able to generalize results because behaviors more natural
  - <u>Disadvantages:</u>
    - More confounding variables present than in a lab experiment
    - Less control over variables gives weaker evidence for cause & effect relationship

Research Methods

- **Quasi-Experiment**
  - Research design similar to an experiment except that participants cannot be randomly assigned to the experimental and control groups
  - Random assignment impossible because independent variable is presence of pre-existing difference

Research Methods

- **Quasi-Experiment**
  - <u>Advantages:</u>
    - Can point in the direction of a causal relationship
  - <u>Disadvantages:</u>
    - Lack of random assignment means you cannot establish causal relationships because of possible confounding variables

Ethics

- Informed Consent
- Freedom to Withdraw
- No Harm
- Deception
- Debriefing
- Confidentiality
- Animal Research
- Institutional Review Board (IRB)

Ethics

- **Informed Consent**
  - Participants must be informed of the general procedure of the study and of their right to withdraw at any point if they choose
  - Participants must give explicit consent to be included in a psychological study
  - Parents could give consent for those under 18

Ethics

- **Freedom to Withdraw**
  - Participants have the right to leave the study at any time
  - If participants begin a study, they are not obligated to finish
  - Participants can choose to have their data removed from the research results

Ethics

- **Do No Harm**
  - Participants cannot be harmed in any way: physical, psychological, emotional, etc.
  - If any harm might come to participants, they must be informed of it before giving consent

Ethics

- **Deception**
  - Participants should not be lied to
  - If the true nature of a study could be easily guessed or influence behavior, then slight deception may be used pending IRB approval
  - Deception of participants cannot be enough to change their willingness to participate in the study

Ethics

- **Debriefing**
  - Participants must be informed of what the study was for, what data was collected from them, and the results of the study upon its completion
  - Necessary regardless of what happens in the study, but *especially* when deception is used

Ethics

- **Confidentiality**
  - When research data is shared, participants' names cannot be associated with it
  - Must remain anonymous

Ethics

- **Animal Research**
  - Animals do not have the same rights that humans do, and more can be done to them for the sake of research
  - Any pain and suffering (and possible death) must be as minimal as possible and be warranted by the topic of study
  - Animal should be treated well and housed in humane conditions while part of the study

Ethics

- **Institutional Review Board (IRB)**
  - Institutions that conduct psychological research have an IRB which will look through all research proposals and decide if the study is ethical or not
  - Studies cannot be conducted unless approved by the IRB

Statistics

- Descriptive Statistics
- Inferential Statistics

Statistics

- <u>Descriptive Statistics</u>: branch of statistics dealing with *summarization* and description of collections of data—data sets

- <u>Inferential Statistics</u>: branch of statistics *drawing conclusions* about a population by using a random sample drawn from that population

Descriptive Statistics

- **Measures of Central Tendency**
  - Description of the average or typical score for a set of research data or distribution
    - <u>Mode</u>: most frequently occurring score
    - <u>Median</u>: middle score, when the set of data is ordered by size
    - <u>Mean</u>: arithmetic average of a set of data; determined by adding all scores and then dividing by the number of scores

Descriptive Statistics

- **Frequency Distributions**
  - <u>Histogram</u>: graphical display of numerical data in the form of upright bars, with the area of each bar representing frequency
  - <u>Frequency Polygon</u>: graphic display of the frequency of a phenomenon that uses straight lines and points
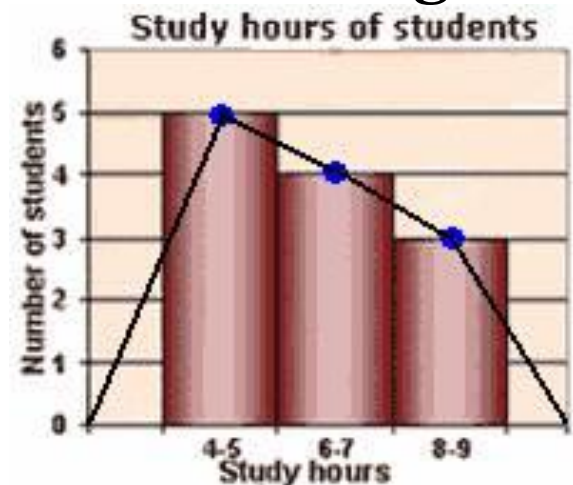
Descriptive Statistics

- **Frequency Distributions**
 - <u>Normal Distribution</u>: symmetric, bell-shaped curve

99.7% between ±3 s.d.

95.4% between ±2 s.d.

68.3% between ±1 s.d.

Only 3 points in 1000 will fall outside the area 3 standard deviations either side of the center line.

s.d. = standard deviation

34.1%   34.1%

13.6%   13.6%

2.1%   2.1%

| -3 s.d. | -2 s.d. | -1 s.d. | Mean | +1 s.d. | +2 s.d. | +3 s.d. |
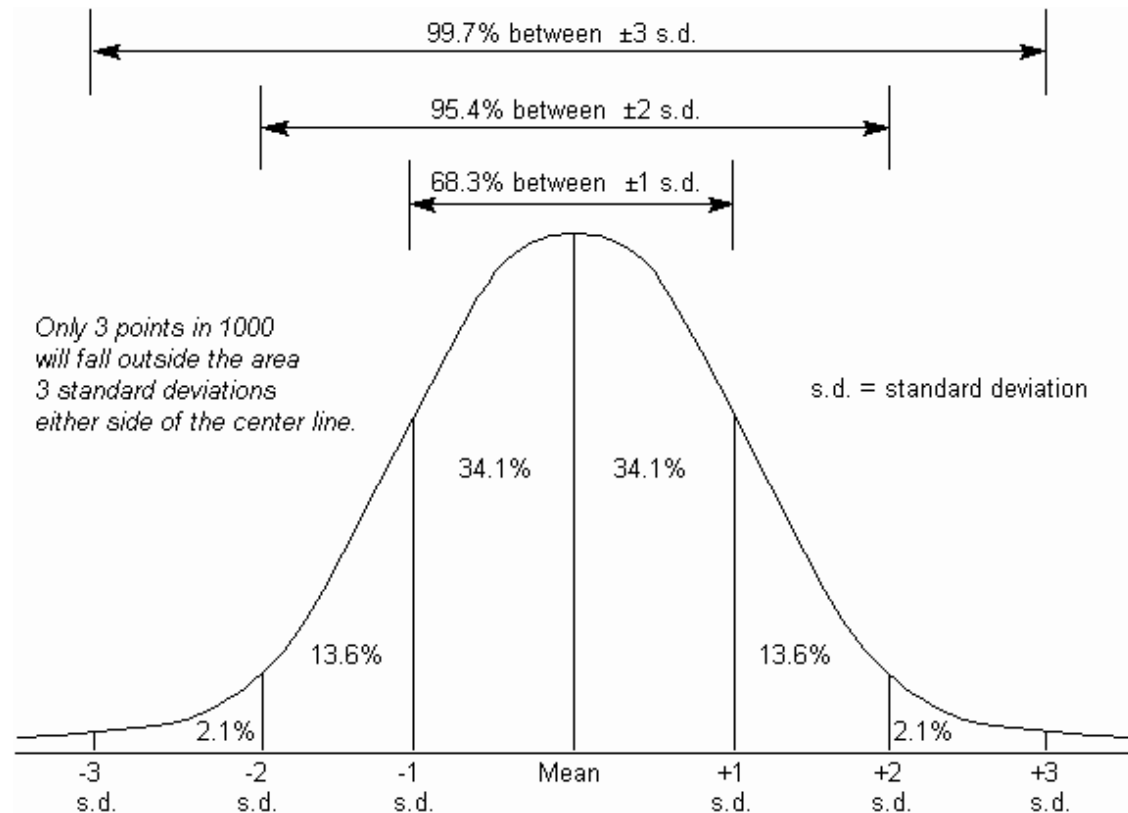
Descriptive Statistics

- **Frequency Distributions**
  - <u>Z Score</u>: a measure of how many standard deviation units from the mean a particular value of data lies
  - <u>Percentile</u>: percentage of scores in a frequency distribution which are lower than or equal to a particular data value
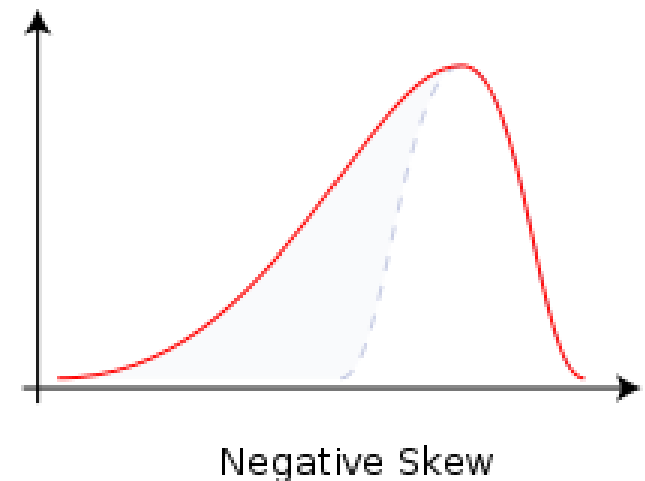
Descriptive Statistics

- **Frequency Distributions**
    - <u>Positively Skewed Distribution</u>: distribution in which only a few of the data points are in the upper range of scores; typically in this distribution the mean > median > mode
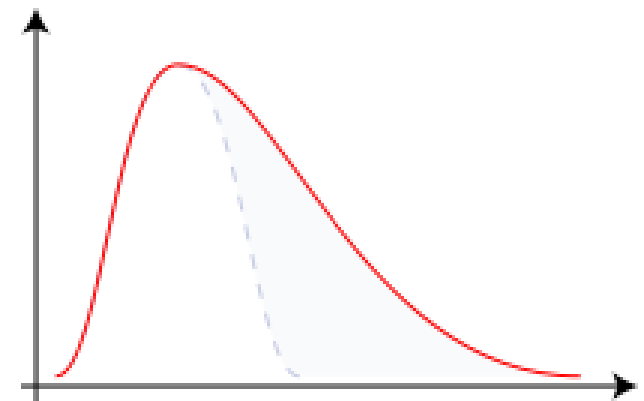
Positive Skew

Descriptive Statistics

- **Frequency Distributions**
  - <u>Negatively Skewed Distribution</u>: distribution in which only a few of the data points are in the lower range of scores; typically in this distribution the mode > median > mean

Negative Skew

Descriptive Statistics

- **Measures of Variability**
  - Describes the spread or dispersion of scores for a set of data or distribution
    - <u>Range</u>: largest score minus the smallest score
    - <u>Variance</u>: measure of statistical dispersion, the variance is a way to capture its scale or degree of being spread out
    - <u>Standard Deviation</u>: measures the average distance between each score and the mean of the data set; square root of the variance

Descriptive Statistics

- **Measures of Variability**
 - Steps to Find Variance & SD
    - Find mean of data set
    - Find the difference b/w each point and the mean
    - Square each difference
    - Add squares together
    - Divide by the number of data points (=Variance)
    - Take the square root of that number (=SD)

Descriptive Statistics

- **Correlational Data**
  - Correlation Coefficient (*r*)
    - <u>Strength</u>: the less the scatter, the higher the strength and higher the predictability (0-1)
    - <u>Direction</u>: slope of the line made by the data points is either positive or negative (+ or -)
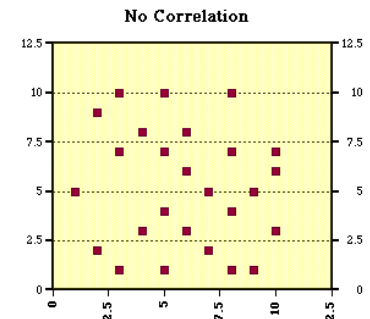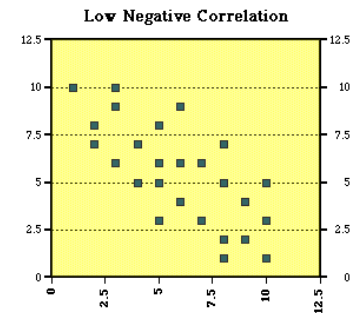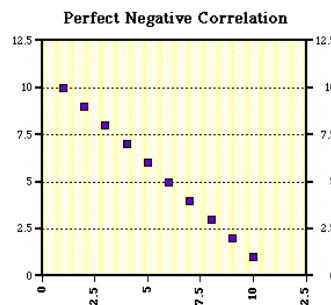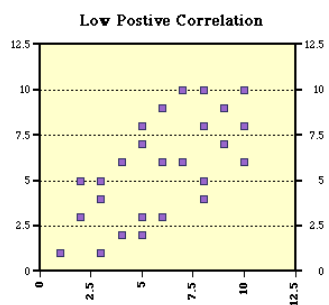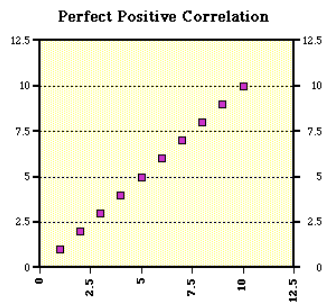
Inferential Statistics

- **Statistical Significance (P)**
  - The condition that exists when the probability that the observed findings are due to chance is less than 1 in 20 ($p<.05$)
  - Results are likely due to manipulation of treatment and not due to random chance
  - Found by completing a t-test

Inferential Statistics

- **Meta-Analysis**
  - A statistical technique in which the results of numerous studies are combined in order to improve the reliability of the results
  - Studies chosen for inclusion in a meta-analysis must be sufficiently similar in order to accurately combine their results
  - Combining studies in this fashion effectively increases the number of participants which increase their power and reliability.