

Experimental research



- **Experiment** = Manipulate a variable to observe changes in a second variable
 - Detection of cause and effect relationships

- **Independent variable (IV)** = variable that is manipulated or controlled
- **Dependent variable (DV)** = variable that is measured and thought to be affected by IV
 - *How does X affect Y?*

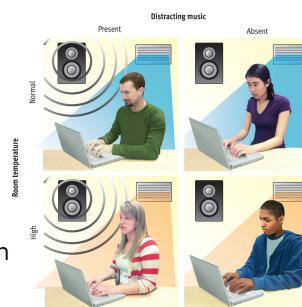
- **Experimental group** – receives special treatment with respect to IV
- **Control group** – does not receive special treatment with respect to IV

- **Extraneous variables** = Differences between groups that could contaminate results
- Note: Groups cannot be identical

- **Confound** - Occurs when variables are linked together, so difficult to separate their specific effects
- Example: Testing two reading enhancement programs

Variations in Experimental Design

- Single group – more than one condition (within subjects design)
- More than one dependent variable
- More than one independent variable
 - Interactions between variables



Experimental research

- Advantages
 - Can draw cause and effect conclusions
 - Disadvantages
 - Artificial nature
 - Ethical limitations
 - Practical limitations (Unable to manipulate some lvs)

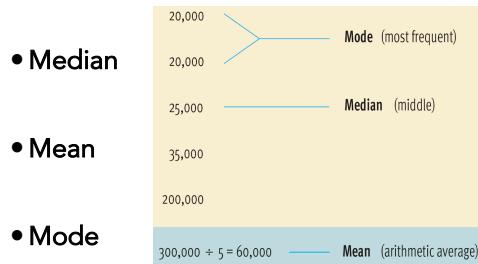
Statistics and research

- Statistics – using mathematics to organise, summarise, and interpret data
 - Everyday
 - Descriptive statistics
 - Inferential statistics



Descriptive statistics

- Measures of **central tendency** = typical or average score in a distribution



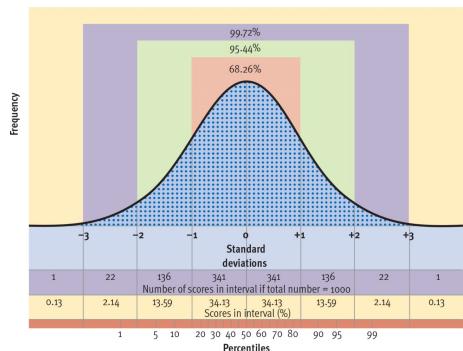
- **Variability** = how much scores vary from each other and from the mean

| Speed (kilometres per hour) | |
|-------------------------------|----------------------|
| Set A Perfection Boulevard | Set B Wild Street |
| 35 | 21 |
| 34 | 37 |
| 33 | 50 |
| 37 | 28 |
| 38 | 42 |
| 40 | 37 |
| 36 | 39 |
| 33 | 25 |
| 34 | 23 |
| 30 | 48 |
| 35 | 35 |
| 2.87 | 10.39 |

Range = 30 to 40 Range = 21 to 50

Mean Standard deviation

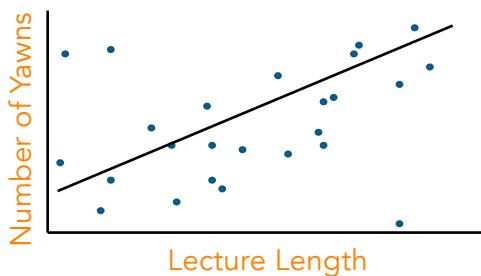
- **Standard deviation** indexes amount of variability



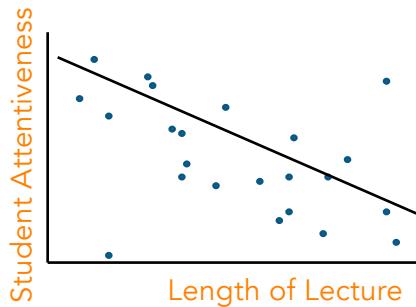
The normal distribution – a symmetrical, bell-shaped curve

- **Correlation** exists when two variables are related
- **Correlation coefficient** = numerical index of degree of relationship between 2 variables
 - Varies from 0 to 1 (STRENGTH)
 - Positive or Negative (DIRECTION)

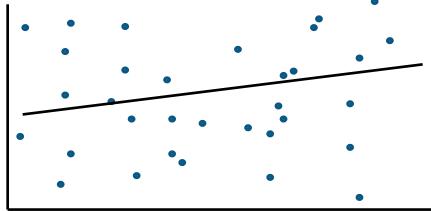
- Positive correlation
- Co-vary in same direction



- Negative correlation
- Co-vary in opposite directions



- Weak (or no) relationship



Examples of correlations

Consider:
Positive or negative correlation?
How should we interpret these results?

Minutes Exercise

Times Your Heart Was Broken

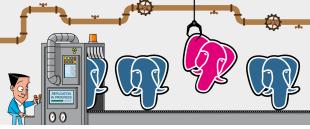
Correlation – Prediction, not Causation

- High school GPA correlated with first year college GPA
- 2 variables might be highly correlated, but not causally related
 - Foot size and vocabulary

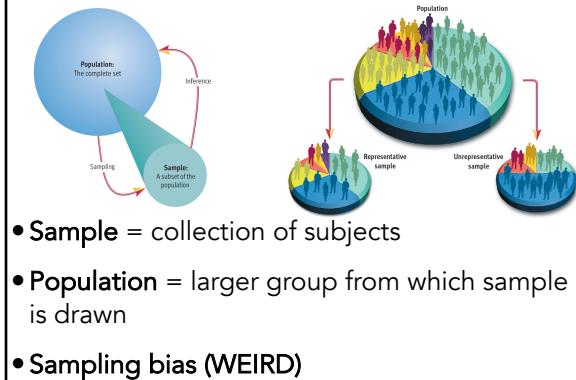
Inferential statistics

- Interpret data and draw conclusions
- Testing the hypothesis: Are the results due to chance?
- **Statistical significance** – probability that observed results are due to chance is very low (less than 5 chances in 100 = .05 level)

Evaluating Research

- Replication – can the results be duplicated? 
- Meta-analysis = a study of many other studies
- Combines the statistical results of many studies asking the same questions

Sample Representativeness



Experimenter Bias

- Expectations influence results
 - Rosenthal and Fode (1973)
 - Double-blind procedure



- **Placebo effects** – a participant's expectations lead them to experience a positive change though they receive empty, or ineffectual treatment



- Nocebo effects

Ethics in Psychological Research



- The question of Deception – is it worth it?
 - Stanley Milgram's obedience study

Ethics in Psychological Research

- The question of Animal Research
 - Led CPA and APA to develop ethical standards – human and animal subjects must be treated with dignity

