Statistics One

Lecture 1
Experimental Research

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Three Segments

- Example 1: Polio Vaccine
- Example 2: Memory Training
- The concept of random

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Lecture 1 ~ Segment 1

Example 1: Polio Vaccine

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Polio Vaccine

- In the first half of the 20th century there were approximately 20,000 cases of polio per year in the USA
- In 1952, there were 58,000 cases

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Polio Vaccine

- In 1952, the first effective polio vaccine was developed by Dr. Jonas Salk
  - How do we know that it was effective?
    - Experimental research!
    - Randomized Controlled Experiments

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Polio Vaccine

- Sample
  - Initial
    - 4,000 children from Virginia
  - Final
    - 1.8 million children from 44 states
- Population
  - All children in the USA

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Polio Vaccine

- Independent variable
  - Treatment
    - Vaccine
    - Placebo
- Dependent variable
  - Polio diagnosis (measure of an individual child)
  - Rate of polio (measure of a group of children)

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Polio Vaccine

- Double-blind experiment
  - Experimenter did not know if the treatment was vaccine or placebo
  - Child (and parents) did not know if the treatment was vaccine or placebo

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Polio Vaccine

- Results
  - Rate (per 100,000)
    - Treatment: 28
    - Control: 71

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Polio Vaccine

- By 1994 polio had been completely eradicated from all the Americas

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Segment Summary

- The major benefit of randomized experiments is they allow for strong claims about causality
  - Why stuff happens!
    - Predict stuff
    - Prevent bad stuff
    - Promote good stuff

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Segment Summary

- Strong causal claims require:
  - True independent variables
  - Random and representative samples
  - No confounds (impossible, but we try our best)

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END SEGMENT

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Lecture 1 ~ Segment 2

Example 2: Memory Training

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Memory Training

- Is it possible for adults to enhance their intelligence by training their working memory?
  - Promote good stuff!

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Memory Training

- Sample
  - College students
- Population
  - Healthy adults

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Memory Training

- Independent variable
  - Training
    - Memory training
    - No training
- Dependent variable
  - Gain in score on an intelligence test
    - IQ gain

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Memory Training

- Procedure
  - Treatment group engaged in memory training for a half hour every day for weeks
    - See next slide
  - IQ
    - All subjects completed a test of intelligence before and after training

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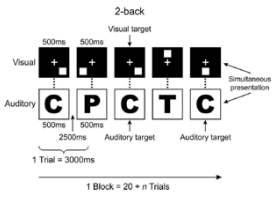
Memory Training



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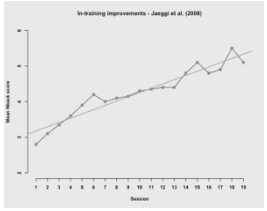
Memory Training



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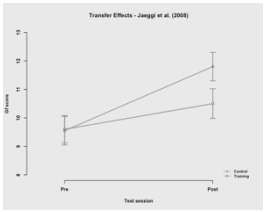
Memory Training



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Memory Training

- Does it really work?
  - Potential confounds?

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Segment Summary

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Segment Summary

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END SEGMENT

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Lecture 1 ~ Segment 3

The concept of random

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Random

- Experimental research requires:
  - Random selection
  - Random assignment

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Random

- Random selection
  - Individuals included in a sample should be randomly selected from the population

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Illustration

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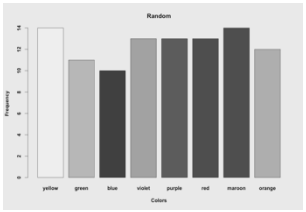
Random



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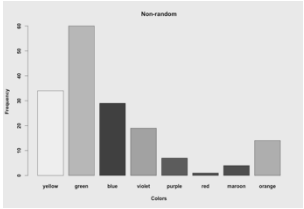
Not random



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Random

- Random assignment
  - Individuals are randomly assigned to conditions

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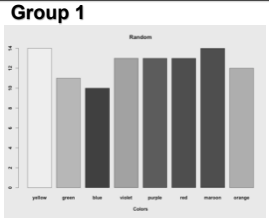
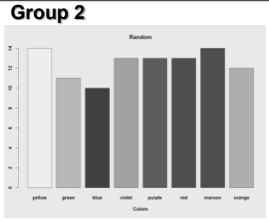
Random assignment

Group 1



Group 2



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Segment Summary

- Experimental research requires:
  - Random selection
  - Random assignment

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END SEGMENT

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END LECTURE 1

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