Intro to Statistics with R: Student's T-test

Independent t-test (1/2)

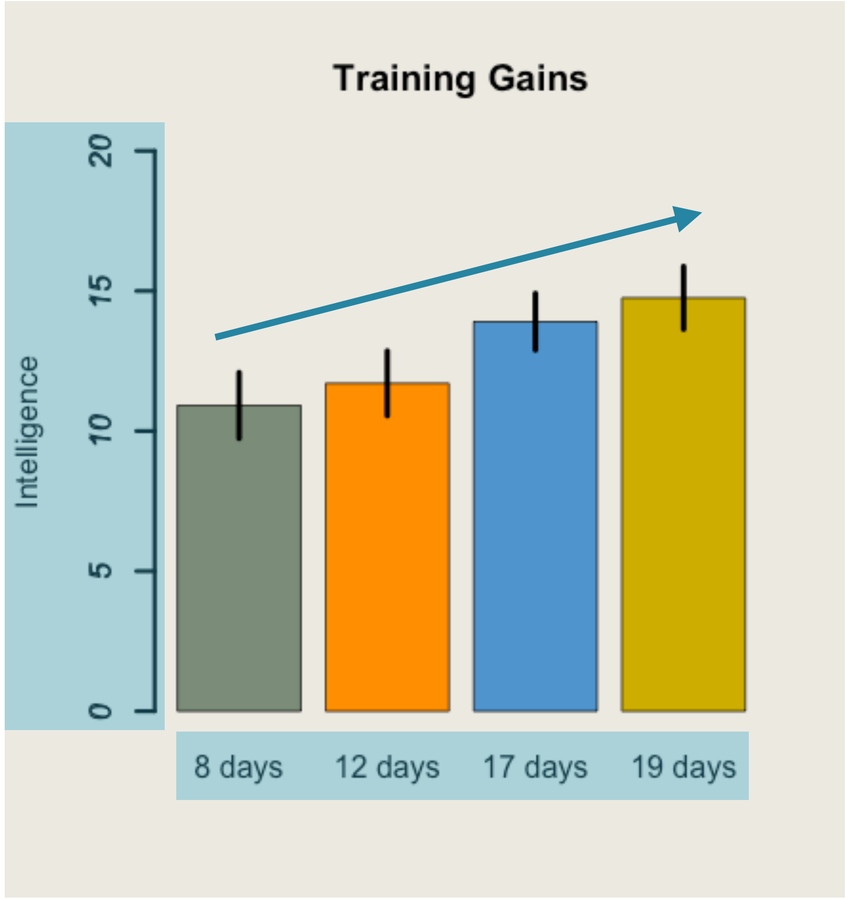
Independent t-test

- Compare means from two independent samples
- Examples
  - Males vs. females
  - Treatment vs. control
  - Patient vs. healthy
- One of the most common statistical tests

Working memory training

- Training and control groups
- Pre-test / post-test design
- Increase in intelligence after training?
- Four independent training groups (8, 12, 17, or 19 days)
- Control group (no training)

Working memory training



Working memory training

- Compare group means with independent t-test
- Thorough analysis will include...
  - t-value
  - p-value
  - Cohen’s d (effect size)

Calculate t-value

- t = (Observed – Expected) / SE
- t = (M1 – M2) / SE
- Standard Error of Difference
  - SE =(SE1 + SE2) / 2
  - SE is the average amount of sampling error
  - Difference expected just due to chance

Intro to Statistics with R: Student's T-test

Independent t-test (2/2)

Independent t-test

- t-test is biased by sample size
- Cohen's d is a common estimate of effects size
  - $d = (M1 - M2) / SD_{pooled}$
  - $SD_{pooled} = (SD1 + SD2) / 2$

Variance assumption

- Homogeneity of variance assumption
- Pooled SD only appropriate if group variances equal
- Otherwise, SE, sampling distribution, and p-value are all invalid

Variance assumption

- Levene’s test
  - Compares variances instead of means
  - If significant, then homogeneity of variance assumption is violated
- If assumption violated...
  - May tell you something important about your data
  - Use Welch's procedure to make independent t-test more conservative