Week 3

Monday, 21 January 2019 16:18

Type 1 error control

- 5e-2 typical α
- Multiple comparison raise type I to well beyond 5%
- ANOVA 2x2x2, 7 tests results in type 1 error of 1-(0.95)ˆ7 = 30%
- Bonferroni correction for multiple tests α/n
- Holm or Pocock correction is a bit better than Bonferroni
- Optional stopping: start with small sample and $p > 0.05$, increase sample size until $p < 0.05$, bad if no type one error control

Positive predictive value

- B A D A D
- A key point in proper statistical analysis is to test a hypothesis with evidence (data) that was not used in constructing the hypothesis
- Low PPV will happen when researchers examine mostly studies where the null-hypothesis is true, with low power, or when the Type 1 error rate is inflated due to p-hacking or other types of bias. Publication bias, power, and Type 1 error rates together determine the probability that significant results in the literature reflect true effects

Optional stopping

- 1 C B B C B D C C
- "With a large enough sample size, the p-value for every simulation drops to zero (if there's a true effect)
- Optional analysis can lead to high type 1 error even if keeping $\alpha < 0.05$ for each look
- Pockock boundary or sequential analysis can help

Pre-registration

- Control type 1 error rate by stating hypothesis before getting data
- If you look at data and create hypothesis the randomness of this data can't be accounted for
- Using a covariate only because it reduces the p-value can lead to studies that lack evidential value
- Confirmatory vs. exploratory research
- HARKing: Hypothesizing After the Results are Known

HARKing: Hypothesizing After the Results are Known
- De Groot 1956 : "When exploring data, you can perform a hypothesis test but you cannot test and hypothesis"
- Pre-register
    - Justify sample size (stopping rule)
    - IV: Independent variables
    - DV: dependent variables
    - Analysis plan(α, data cleaning, power)
    - Design - Pre-register - Collect - Analyse - Publish

Exam

- **B C B BX C**