

Case 6: Power Analysis for Innovative Teaching on Posttest Improvement

A researcher plans a randomized controlled trial to evaluate the effectiveness of an innovative teaching approach compared to a traditional method. Scores on a standardized final exam will be used to examine the effectiveness of the innovative teaching approach, and pretest scores will be collected as covariates. A previous, closely related study reported the effect size of the teaching method after adjusting for the pretest scores as is $\eta_p^2 = 0.06$. The researcher wants to conduct a power analysis to determine the required sample size for different target powers (0.7, 0.8, 0.9) at a significance level of 5%. Due to resource constraints, the researcher expects that the maximum feasible sample size is 100 students, so they also want to perform a sensitivity analysis to determine the minimum detectable effect size given a fixed sample size.

Initial Questions

1. What are the research objectives?
2. What are the statistical questions?
3. What is the response variable, and what is the data type of the response variable?
4. What are the explanatory variables of interest?
5. Are there covariates?
6. What is the population of interest?
7. What is the subject, and what is the number of distinct subjects?
8. Are there subject-level data?
9. Are response variables dependent (repeated measures / clustered subjects)?
10. Are the subjects selected randomly?
11. Are the subjects randomly assigned to different groups?

Initial Thoughts