Homework 2
Psychology 311
Spring, 2015

Note. The file Code.txt contains routines useful for performing this assignment. Maximum Score = 60 points.

1. (20 points). Suppose you are planning to run a 2-group experiment using independent samples of equal size n, so that the total number of participants in the study will be $2n$. If the standardized effect size is

$$E_s = \frac{\mu_1 - \mu_2}{\sigma} = 0.8$$

   (a) (10 points). What is the minimum sample size n *per group* required to yield a power of at least 0.95 if the test is two-sided with $\alpha = 0.01$?

   (b) (10 points). Using either R or GPower, produce a plot of power vs. sample size for $10 \leq n \leq 100$.

2. (20 points). You are planning to test the null hypothesis that

$$(\mu_1 - \mu_2) - (\mu_2 - \mu_4) = 0$$

   using 4 independent groups of size $n = 25$ each.

   (a) (10 points). What is the power if

$$E_s = \frac{(\mu_1 - \mu_2) - (\mu_2 - \mu_4)}{\sigma} = 0.25$$

   (b) (10 points). What sample size n *per group* is required to yield power of at least 0.99?

3. (20 points). You plan to compare an experimental and control condition in a repeated measures design in which 45 people are measured twice. The results for the experimental and control conditions are believed to correlate positively, with $\rho = 0.60$ in the population. Suppose that $\sigma = 10$ in both the experimental and control conditions.

   (a) (10 points). Suppose we define E_s $(\mu_{\text{Experimental}} - \mu_{\text{Control}})/\sigma$. If $E_s = 0.40$, what is the power in the design, assuming the test is two-sided and that $\alpha = 0.05$? Perform the calculations using the R function Power.T2Correlated.

   (b) (10 points). Then verify your calculations using GPower 3. Still assume that $\rho = 0.60$.