In-Class Exercise: Power and Sample Size Calculation

Psychology 311

Spring, 2013

1. You believe that a particular training program will improve the physical fitness (as measured by oxygen uptake) of a group of military recruits. The measured oxygen uptake of the recruit population has been established to a high degree of accuracy over a number of years at a value μ_0. Your plan is to administer the new training program to a randomly selected group of 75 recruits, then perform a 1-sided t-test with $\alpha = 0.01$ of the hypothesis that $H_0 : \ \mu \leq \mu_0$, which is the opposite of what you actually believe.

   (a) If the standardized effect size $E_s = (\mu - \mu_0)/\sigma$ is really 0.30, what is the power of your design to reject the null hypothesis? Use the `Power.T1` function defined in the *Code.txt* file.

   (b) Assuming that you are "stuck" with an n of 75, about how large would the standardized effect size have to be before power is at least 0.90? Use a graphical approach together with the `Power.T1` function.

   (c) Assume that $E_s = 0.30$ as before, but that now you have the ability to increase sample size. How large would sample size have to be to guarantee power of 0.90 to detect the experimental effect?