Power Analysis Homework PSYC 2101 March, 2018©

Work each of the exercises first by hand and then using G∗Power 3. Check your solutions with those shown at the end of the document.

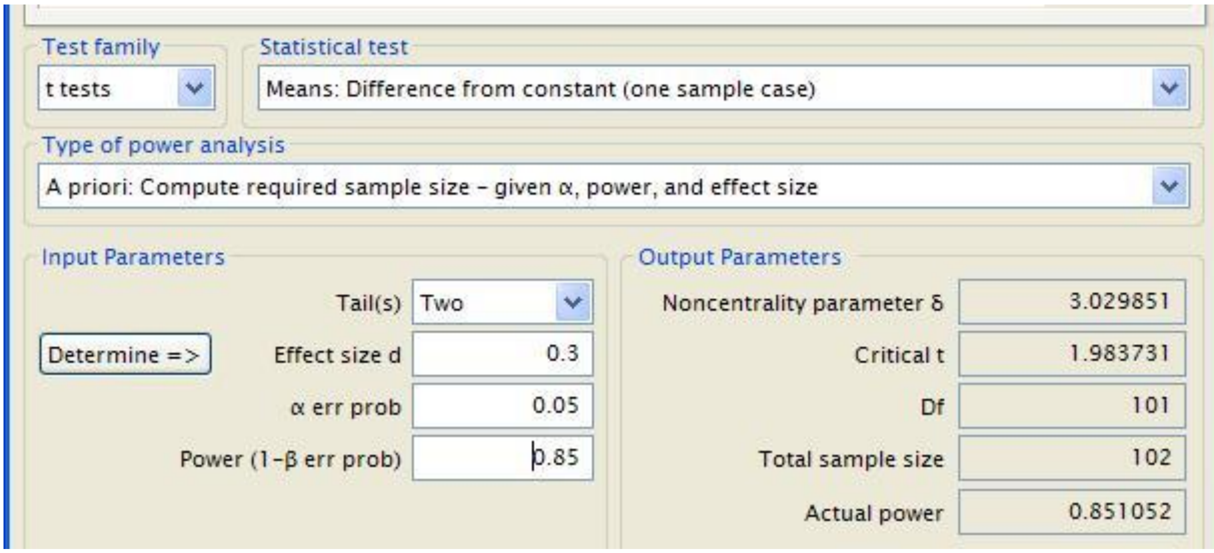
1. We wish to determine whether a morale problem exists among the employees of the Müller salt mines. We plan to administer a standardized test of morale to some number of miners. We know that among miners nationwide the mean score on this test is **50**, with a standard deviation of **10**. How many Müller miners should we test if we want to have an **85%** chance of detecting a difference between the mean for Müller miners and the nationwide mean? Assume that we have decided that **3** points is the minimum nontrivial effect size – that is the three point difference between 50 (the national mean) and 47 (the mean for our miners were there a three point morale problem). Employ a **.05** criterion for α.

2. Suppose you are to evaluate the effectiveness of a new program at Müller mines. The program, which involves employees participating in loosely structured recreational activities at the employer's expense, was expected to change workers' morale, productivity, etc. For a random sample of **36** employees you have both pre- and post-program morale scores. Assuming that morale scores have a standard deviation of **10** and that the correlation between pre-program morale and post-program morale is **+0.595**, what are your chances of detecting a change in mean morale as small as **3** points if you employ a **.05** criterion for alpha?

3. You are going to evaluate the effectiveness of Program A (that described in problem number 2 above) versus Program B. Program B involves more rigidly structured recreational activities. If you have morale-change scores (post-program morale minus pre-program morale) for each of **40** employees under Program A and for each of **60** employees under Program B, what are your chances of detecting an effect as small as **three-tenths** of a standard deviation? That is, if the programs differ from one another by less than 0.3 of a standard deviation, you consider the two programs to be essentially equivalent in effectiveness. Assume that you employ a **.05** criterion for alpha.

Solutions

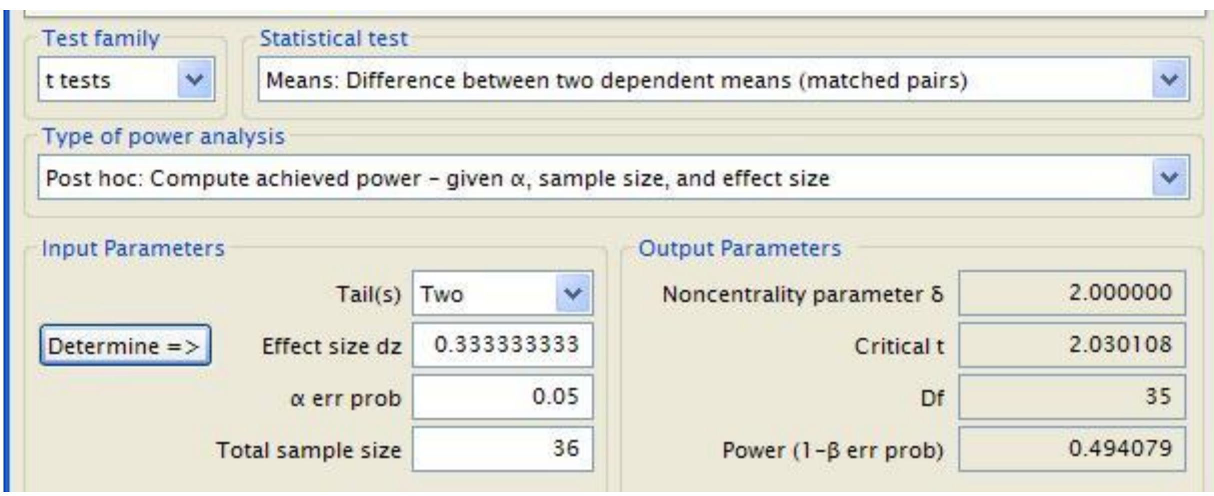
1. $d = \frac{3}{10} = .3$ $\qquad N = \left(\frac{\delta}{d}\right)^2 = \left(\frac{3.00}{.3}\right)^2 = 100$



2. d is still .3, but we need correct it for the power-enhancing effect of the within-subjects design.

$$d_{Diff} = \frac{d}{\sqrt{2(1-\rho)}} = \frac{.3}{\sqrt{2(1-.595)}} = 1/3. \ \delta = d_{diff}\sqrt{n} = 1/3\sqrt{36} = 2.00$$

From the power table, power = 0.52.



3. d = .3. $\tilde{n} = \dfrac{2}{\dfrac{1}{40} + \dfrac{1}{60}} = 48 \quad \delta = d\sqrt{\dfrac{\tilde{n}}{2}} = .3\sqrt{\dfrac{48}{2}} = 1.47$

From the table:

Delta	Power	Interpolation for delta = 1.47
1.40	.29	Power = $.29 + \dfrac{7}{10}(.32 - .29) = .31$
1.50	.32