

## 13.3: Power Demo

### Learning Objectives

- State the effect of one- versus two-tailed tests on power
- State the effect of  $\alpha$  level on power

### Instructions

This simulation illustrates the effect of

- a. sample size
- b. the difference between population mean and hypothesized mean
- c. the standard deviation
- d. the type of test (one-tailed or two)
- e. significance level on the power of a two-sample  $t$  test

You specify the difference between the population mean and hypothesized mean by either entering text in the box or by moving the slider. The population standard deviation can be entered in the box or specified by the pop-up menu. Finally, you specify the number of tails of the test. A power graph for the significance level 0.10, 0.05, and 0.01 significance levels as a function of sample size is displayed.

1. Examine the power curves. The  $X$  axis shows sample size, the  $Y$  axis shows power. Note the effect of sample size and significance level on power.
2. The default difference between the population mean and hypothesized mean is 1.55. Use the slider to change this value and note the effect on the power curves.
3. Change the population standard deviation ( $sd$ ) and notice its effect on power.
4. Compare the power of one-tailed and two-tailed tests when the difference between the population mean and hypothesized mean is 2. Determine which is higher.
5. Set the difference between the population mean and hypothesized mean to zero. Since the null hypothesis is true, the  $Y$  axis now shows the **Type I** error rate, not power. Note the effect of sample size on the **Type I** error rate.
6. Determine the effect of changing the standard deviation on the **Type I** error rate.

### Illustrated Instructions

#### Video Demo

The video demonstration begins by changing the population mean and hypothesized mean difference to 2 and then the population standard deviation to 3.5. Notice how the power curves change with each adjustment. The video by switching between one-tailed and two-tailed tests.

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