Demo: Exploring the Power Animation

In this video, we use the Power animation to explore the relationship between sample size and power for a one-sample t test using the file Diameter Test.jmp.

First, we conduct a one-sample t test for Diameter. To do this, we use the Distribution platform from the Analyze menu. We select Diameter as the Y, Column and click OK.

Then we select Test Mean from the red triangle for the analysis.

We'll test the null hypothesis that the mean diameter is 16.12 mm against the alternative that the mean is not 16.12.

The p-value for the two-tailed test is 0.0036. We can reject the null hypothesis that the true mean is 16.12.

To explore the power of this test, we use the Power animation. To do this, we select Power animation from the red triangle for Test Mean.

The estimated mean and the true mean are set at the sample mean, 16.1406.

The red curve represents the distribution of sample means under the null hypothesis. The blue curve is the sampling distribution under the hypothesis that the estimated mean represents the true mean.

The red shading in each tail represents alpha, the significance level, and the blue shading represents beta, the false negative rate.

The difference between the estimated and hypothesized values is 0.0206 mm. The power of this test, 1 minus beta, is 0.85. This test can easily detect the difference between the estimated mean and the hypothesized value.

What if we had only 20 observations instead of 50? The power of the test to detect this difference drops substantially.

We'll set the sample size back to 50.

What if the means are closer together? We can drag the curve for the hypothesized mean to increase or decrease the difference between the means. As we decrease the difference, notice that the power of the test decreases as we move the means closer to one another.

The smaller the difference between the means, the less power the test has in detecting a difference.

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