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Calculating the Sample Size for One-Sample t Tests

When you are planning for data collection or designing a study, it's important to make sure that your test has enough sensitivity, or power, to detect differences that you consider important.

Recall that, in the metal parts scenario, the team wants to pilot changes before implementation. Suppose that your plan is to collect data and perform a one-sample t test to see whether there is evidence that the process is not on target after making these changes.

To calculate the sample size required to detect a critical difference, you need the following information: alpha, the significance level for your test; an estimate of the standard deviation; and the difference between the sample mean and the hypothesized value that you need to be able to detect.

You also need to specify the desired power of the test. Remember that power is the probability of detecting the specified difference, at a given alpha level. This is typically set at 0.90 or 0.95.

For the metal parts scenario, suppose that you need to detect a difference of at least 0.3 hundredths of an inch from the population mean. If the significance level is 0.05, the estimate of the standard deviation is 1.28, and we specify a power of 0.90, you'd need 194 observations to detect this difference.

This test will require a lot of data, and it might be cost prohibitive. If you can live with detecting a difference of 0.5 units (or more), you'd need only 71 observations.

Of course, there are trade-offs when you're determining the sample size. For example, if you need to detect a difference of 0.5 units, a higher sample size results in higher power. And, if you require a power of 0.9, you'd need an extremely large sample size to detect differences much smaller than 0.4 or 0.5.

You see how to use the JMP Sample Size and Power calculator for a one-sample t test in the next video.

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