

Demo: Conducting a Two-Sample t Test

In this video, you learn how to conduct a two-sample t test using the file `Breaking Strength.jmp`.

In this scenario, the characteristic of interest is the breaking strength of a part in ksi (kilos per square inch). Parts are typically made using Material 1, but they can also be made using Material 2. You've measured the breaking strength for 10 randomly selected parts made from each material. You want to test the null hypothesis that the mean breaking strength for parts made using the two materials is the same against the alternative that the means are not equal.

To conduct this test, we select Fit Y by X from the Analyze menu. We select Strength as the Y, Response, and Material as the X, Factor.

The key in the bottom corner of the dialog box tells us that JMP will conduct a one-way analysis. One-way analysis is used when you select a continuous response variable and a categorical factor or input variable.

JMP produces a scatterplot of Strength versus Material. To better see the individual observations, we select Display Options from the red triangle, and then Points Jittered.

The spread of the data for the two materials is similar, so we run the pooled two-sample t test. To do this, we select Means/Anova/Pooled t from the red triangle.

JMP adds mean diamonds to the graph and produces several tables of statistical output.

The mean diamonds are 95% confidence intervals for the mean strength for each material. We can see that these diamonds don't overlap. This indicates that the means are significantly different.

Let's examine the statistical output under Pooled t Test.

The difference in mean strength between Material 2 and Material 1 is 25.5 ksi.

Using the curve, you can see that this difference is extreme relative to the hypothesized difference of zero.

And you can also see that zero doesn't fall in the 95% confidence interval for the true difference.

For a formal test, we look at the p-value. The p-value is extremely low, indicating that the difference in the means is significant.

You don't need to look at all of these pieces of information, but they all lead to the same conclusion: There is a significant difference in the strength of parts made using the two materials.

If the spread of the distributions is very different, you should run the unpooled two-sample t test instead of the pooled version. We'll run this test so that we can compare the results.

To do this, we select t Test from the red triangle.

For this example, the unpooled and the pooled versions of the tests lead to the identical conclusion: There is a significant difference in the means for the two materials.

Note that, if you're interested in testing that the variances are equal, you can run several unequal variance tests. To do this, we select Unequal Variances from the red triangle menu.

Because we are comparing two groups, JMP conducts five unequal variance tests. The p-values for each of these tests are greater than a significance level of 0.05, so we don't have evidence that the variances are not equal.

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