Two-Sample T Test

Is the difference in mean police confidence scores between men and women statistically significant?

One of the questions that you may have had when we compared mean confidence in the police between men and women was whether the slight difference in mean score was important. On average, women have lower police confidence scores than men do. (Remember that due to the way this variable was created, a lower score actually implies higher confidence in the police. This means that despite their lower score, women have higher confidence in the police than men do.) Importance can be thought of in a number of different ways. For example, is the difference large enough to be interesting? Alternatively, you may want to consider whether the difference in means across both sexes is simply due to chance. Because we calculated these means from data from a sample of the population, it may be that taking a different sample would show no difference between the sexes. In order to investigate this, we can run a t test to see whether this difference in means is statistically significant.

In a t test, like in most tests of significance, the significance threshold is traditionally set at $p = 0.05$. A p-value is basically a measure of the likelihood of finding a mean difference by chance if indeed there is no difference in the population. If in the population there is no difference between confidence for males and females, just by randomly selecting the sample we may have caused there to be a different mean for males and females. We can work out the chances of the result we have obtained happening by chance. If a p-value reported from a t test is less than 0.05, then that result is said to be statistically significant. If a p-value is greater than 0.05, then the result is insignificant.

Because we have already run frequencies and checked the normality of our sample, we can run a t test to check for significance.

We are going to use the **Independent-Samples T Test**, because we are interested in comparing the means across the two unrelated categories male and female in the variable **sex**.

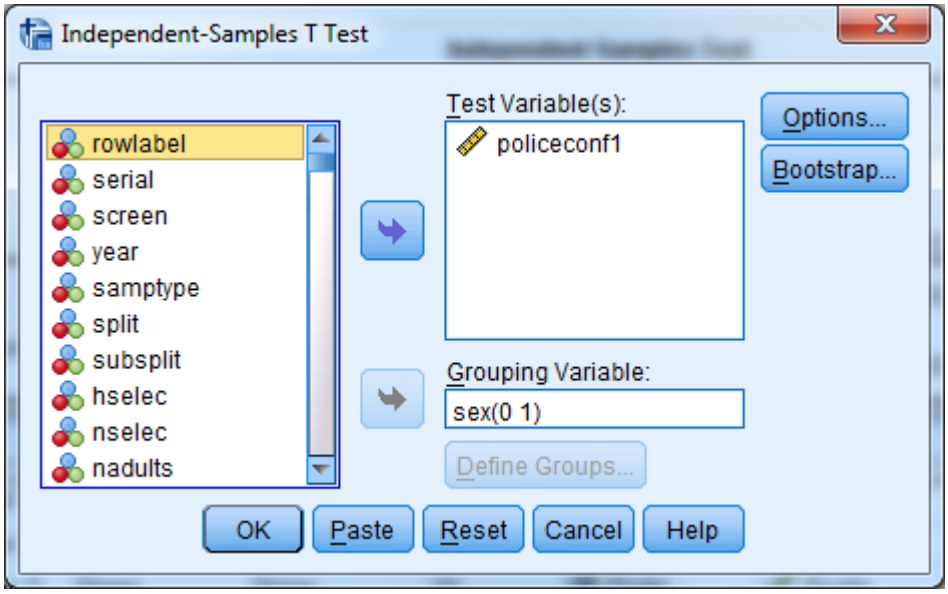
Select **Analyze**, **Compare Means**, and then **Independent-Samples T Test**.

Move our variable **policeconf1** to the **Test Variable(s)** box.

Move sex to the **Grouping Variable** box.

Click on **Define Groups** and enter **1** in the **Group 1** box and **2** in the **Group 2** box (as the category Male is coded as 1 and the category Female is coded as 2 in our dataset – if they were coded as 0 and 1 in the dataset we would enter these values instead). Click **Continue**.

The **Independent-Samples T Test** dialogue box should look like this:



Click **OK**. You should get the following output:

Group Statistics

	Adult number 1 (respondent): Sex	N	Mean	Std. Deviation	Std. Error Mean
I have confidence in the police	Male	19690	13.7612	4.36176	.03108
	Female	22914	13.3249	4.26643	.02818

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
I have confidence in the police	Equal variances assumed	11.652	.001	10.417	42602	.000	.43638	.04189	.35428	.51849
	Equal variances not assumed			10.400	41353.132	.000	.43638	.04196	.35414	.51862

From the **Group Statistics** table above, you can see that SPSS has again calculated the number of male and female respondents and the mean scores for both groups. We've also been provided with the standard deviations for both men and women.

In the **Independent Samples Test** table, SPSS gives us the significance levels of the differences in means. There are actually two separate statistical tests included in the second table shown. The first test, **Levene's Test for Equality of Variances**, tests whether the two means have been taken from sample populations that have equal variance. This matters for the actual t-test – if the variation in confidence for males and females is the same then we would use a different form of the t-test than if the variation was different. For this test, a p-value of less than 0.05 indicates that there are, in fact, different variances for males and females. The p-value reported for **Levene's Test for Equality of Variance** in the table above is p = 0.001, which is well below the 0.05 threshold. So, we can say that

"equal variance is not assumed" for this sample and go on to check the significance level reported in the **t test for Equality of Means** section. Because we have decided that equal variances are not assumed, we are going to use the p-value presented in the second row of the table, as seen below. If we had found equal variances in the **Levene's Test**, then we would use the top row.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
I have confidence in the police	Equal variances assumed	11.652	.001	10.417	42602	.000	.43638	.04189	.35428	.51849
	Equal variances not assumed			10.400	41353.132	.000	.43638	.04196	.35414	.51862

The p-value presented in the "equal variances not assumed" row for this t test is 0.000, much lower than the p-value significance threshold of 0.05. This tells us that the difference in the police confidence means between men and women is statistically significant.

*Run another two-sample t test to see if there is a statistically significant difference in police confidence mean score between respondents in the variable **yrhostol**, which concerns whether or not a respondent has experienced theft from his or her home. (Before you run the test, use the Frequencies function to make sure there are no coded missing values in **yrhostol**. If there are, recode them.) What are the results of your t test? Are they what you might expect?*

*Run another two-sample t test to see if there is a statistically significant difference in police confidence mean score between respondents in the variable **mottheft**, which concerns whether or not a respondent has experienced theft of a motor vehicle. (Before you run the test, use the Frequencies function to make sure there are no coded missing values in **mottheft**. If there are, recode them.) What are the results of your t test? Are they what you might expect?*

Summary

You've just run a two sample t test to determine whether or not the differences in mean police confidence scores between men and women are statistically significant. You used the Levene's Test for Equality of Means to determine that equal variance was not assumed, and therefore the difference in mean scores is not due to chance and is statistically significant.