2-Sample (independent samples) $t$-tests in SPSS

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Note: SPSS always uses $t$-scores for two-sample tests of means, never $z$-scores. Note: SPSS always tests the null hypothesis $H_0: \mu_1 = \mu_2$ by testing $H_0 : \mu_1 - \mu_2 = 0$, which is equivalent.

1. Start SPSS and enter your data or open your data file.
   
   • Make any necessary adjustments in the Variable View. Pay particular attention to the Measurement levels of your variables. After all, if the data aren’t scale, we shouldn’t be using them in a $t$-test.
   
   • You MUST stack your data. This means all your measurements have to be in the same column. (If your data are already stacked, then skip to Step 2.) To stack your data,...
     
     – Create two new variables in the Variable view. One will hold the stacked data, the other will indicate the group to which each measurement belongs. Name them appropriately.
     
     – Make any necessary adjustments to the variable for your stacked data (e.g., the number of decimal places, etc.). In particular, make sure the Measurement level is Scale.
     
     – Also make adjustments to the grouping variable. YOU MUST USE NUMBERS FOR THE NAMES OF YOUR GROUPS. For unfathomable programming reasons, SPSS can’t use words for group names in ANOVA. **WARNING:** THE MEASUREMENT LEVEL OF YOUR GROUPING VARIABLE IS Nominal, EVEN THOUGH ITS VALUES ARE NUMBERS! Please make this adjustment in the Variable View.
     
     – Go to the Data View. Copy-and-paste the data for the first group into the column for the stacked data. Then type the number of the first group in the grouping variable’s column, next to each of the first group’s measurements.
     
     – Copy-and-paste the next group’s data into the stacked data column. Do not replace any of the first group’s data, and do not leave any blank cells between the first group’s data and the second group’s data.
     
     – Then type the name of the second group in the grouping variable’s column, next to each of the second group’s measurements.
     
     – Repeat until all the data are stacked in the stacked data column, making sure that the correct group name is next to each measurement, in the grouping variable column.
   
   • Your data are now stacked. Note that your grouping variable is an explanatory variable, representing the relevant factor in your experiment or study.

2. In the Analyze menu, click Compare Means. A submenu appears.

3. In the submenu, click Independent-Samples T Test... The Independent-Samples T Test dialog will appear.

4. Put in the Test Variable(s) box the name of the column that contains your stacked measurements. Put in the Grouping Variable box the name of the column that tells which group each measurement is in.
5. Now you have to define your groups. This just tells SPSS which two groups to compare. (After all, you might have more than two groups.) So:
   - Click the Define Groups… button. The Define Groups dialog appears.
   - Make sure the Use specified values radio button is lit. Put the code number of your first group in the Group 1 box and the code number of your second group in the Group 2 box.
   - Click Continue. SPSS returns you to the Independent-Samples T Test box.

6. SPSS will give you a confidence interval for the difference between the means, whether you want one or not. The default confidence level is 95%. If you’d like some other confidence level, then...
   - ...Click Options. The Independent-Samples T Test: Options dialog will appear.
   - You will see an entry for Confidence Interval Percentage and a box with a number in it, followed by a percent sign. The number in the box is the confidence level for your confidence interval. The default value is 95, for 95% confidence. If you want a different confidence level, type it in the box, as a percentage (not as a decimal number).
   - Click Continue. SPSS will return you to the Independent-Samples T Test dialog.

7. Click OK. The SPSS output will appear in the the PASW Statistics Viewer output window, as follows:
   - First, there is a Group Statistics table. It tells you:
     - The name of the column containing the stacked data.
     - The names of your groups.
     - An N for your first group. N is the number of valid data from your fist group that SPSS used in its calculations. Also an N for your second group. Always check these numbers, to ensure all your data were used.
     - Mean, which contains the sample means for the two groups.
     - Std. Deviation, which gives the standard deviations for the two groups.
     - Std. Error Mean, which is just \( s_x/\sqrt{n} \), for each group. (We're not using this at the present time.)
   - Next is the Independent Samples Test table. It has two rows in it. One is labeled Equal variances assumed and the other is Equal variances not assumed. Use the row your instructor tells you to use. In each row, the table gives you:
     - The name of the column containing your stacked data.
     - A pair of columns for Levine’s Test, which my 200-level Statistics classes do not use, neither the value of F, nor the Sig. value.
     - The test statistic t for the independent samples test. This is the test statistic we need.
     - df, the number of degrees of freedom. Note: For technical reasons, the degrees of freedom in the Equal variances not assumed row, the df will (almost) never be a whole number, and this is OK.
     - The value Sig. (2-tailed). If your test is two-tailed (that is, if your alternative hypothesis is \( H_1: \mu_{\text{group 1}} \neq \mu_{\text{group 2}} \)), then this is your P-value. If your test is one-tailed (that is, if your alternative hypothesis is either \( H_1: \mu_{\text{group 1}} < \mu_{\text{group 2}} \) or \( H_1: \mu_{\text{group 1}} > \mu_{\text{group 2}} \)), then you must divide Sig. (2-tailed) by 2 to get your P-value.
     - The Mean Difference, which is really the difference between the sample means (that is, it’s \( \bar{x}_{\text{group 1}} - \bar{x}_{\text{group 2}} \).
     - The Std. Err. Difference, which is the standard deviation of the difference \( \bar{x}_{\text{group 1}} - \bar{x}_{\text{group 2}} \).
     - The Lower and Upper bounds of a Confidence Interval for \( \mu_{\text{group 1}} - \mu_{\text{group 2}} \).

As always, if you have questions, please ask them!

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1 My FDMath 223 classes don’t use this.