

Graphing on Excel

You can easily create presentation-quality graphs using Excel. Below are instructions for bar graphs and line graphs. It is often best to use a bar graph for a single factor (e.g., a one-way ANOVA or a main effect from a factorial ANOVA), a line graph for two factors (e.g., an interaction effect). The instructions provided below are highly detailed; once you have done this a couple of times, you will see how simple it is. There are many options that you can play around with, such as changing fonts and sizes, colors, and so forth. In general, double-clicking on any element of an Excel graph will show you all the options available for modifying it. To print a graph on Excel, select the graph by single-clicking anywhere inside of it, then choose "Print Preview" from the "File" menu to confirm that you've selected only the graph. You can then click "Print" to go ahead, and what you see is what you'll get.

Bar Graph (for k levels of a single factor)

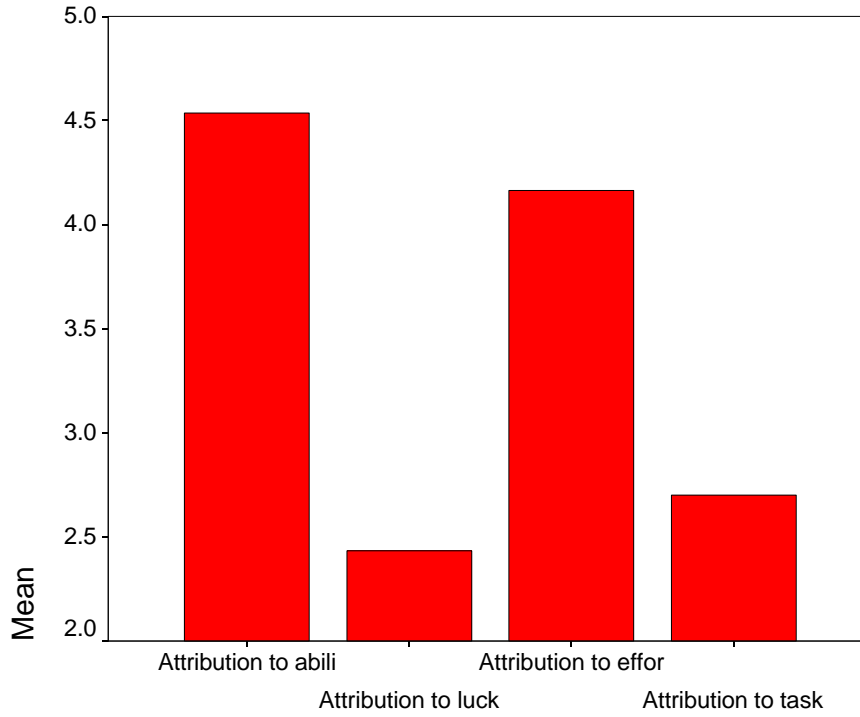
1. Enter labels for each condition into k cells along one row
2. Below each label, type in the mean for that condition
3. A couple of lines below the means, enter the standard errors for each. The standard error for a mean equals its SD divided by the square root of N (the number of scores that were averaged to get the M being plotted). You can have Excel calculate each standard error from the standard deviation and sample size for that condition by typing in this formula: "=[standard deviation]/sqrt([sample size])"
4. Highlight the block of cells that includes all labels and means (k cells wide, 2 rows tall)
5. Click the "Chart Wizard" button (usually the third to the left of the "100%" indicator), or select "Chart" from the "Insert" menu
6. Leave the setting on the default "Column" type of graph, click "Next"
7. Leave the data series option on "Rows" and just click "Next"
8. Under the "Titles" tab, type in labels to the x and y axes (remember not to title the chart)
9. Under the "Gridlines" tab, turn off "Major gridlines"
10. Under the "Legend" tab, turn off "Show legend," then click "Finish"
11. Resize the graph to roughly 3:4 proportions (just a bit wider than it is tall)
12. Double-click inside the "Plot area" (the background of the chart, usually colored gray), then select "none" under "Border" and "none" under "Area," and click "OK"
13. Double-click on one of the tick marks or labels of the "Category axis" (x-axis), then select "none" under "Major tick mark type." Then, select the "Font" tab so that you can change the font size to ~12 pt and turn off "Auto scale."
14. Double-click on one of the numbers on the "Value axis" (y-axis), then go to "Scale" and enter a reasonable "minimum" and "maximum" value, plus a "major unit" that will divide the scale into a nice set of numbered tick marks. Again, select the "Font" tab so that you can change the font size to ~12 pt and turn off "Auto scale."
15. Double-click on the y-axis label. Change the font to ~12 pt bold and turn off "Auto scale." Click "OK" and repeat for the x-axis label.
16. Double-click on any of the bars, select the "Y error bars" tab, click on the "Custom" selection (toward the bottom), then use the red arrow pointing toward the upper left to go to the spreadsheet and highlight the cells containing the standard errors (once they're highlighted, use the red arrow pointing downward to accept this selection), then click "OK"
17. Finally, single-click just inside the outer edge of the graph itself to select the entire graph. From the "Format" menu, choose "Format chart area" and then select "none" under "Border."

Line Graph (for j levels of one factor by k levels of the other factor)

1. Enter labels for each condition of the first factor into j cells along one row that will form the top of your table of means, and labels for the second factor into k cells along one column that will form the left of the table
2. Type in the mean for each condition into your j by k table
3. A couple of lines below the table of means, enter a parallel table containing the standard errors for each mean. (See above for how to have Excel calculate standard errors.)
4. Highlight the block of cells that includes all labels and means (j+1 cells wide, k+1 rows tall)
5. Click the “Chart Wizard” button (usually the third to the left of the “100%” indicator), or select “Chart” from the “Insert” menu
6. Choose the “Line” type of graph, click “Next”
7. Try out both data series options (“Rows” and “Columns”) to determine which you like best (they provide identical information, but may look quite different), and click “Next”
8. Under the “Titles” tab, type in labels to the x and y axes (remember not to title the chart)
9. Under the “Gridlines” tab, turn off “Major gridlines”
10. Click on the “Plot area” (the background of the chart, usually colored gray), and the drag its upper-right corner as far toward the top right of the entire graph area as you can to enlarge the graph; move the legend someplace within the graph that it doesn’t interfere with the lines, such as the top right corner
11. Resize the graph to roughly 3:4 proportions (just a bit wider than it is tall)
12. Double-click inside the “Plot area,” then select “none” under “Border” and “none” under “Area,” and click “OK”
13. Double-click on one of the tick marks or labels of the “Category axis” (x-axis), then select “none” under “Major tick mark type.” Then, select the “Font” tab so that you can change the font size to ~12 pt and turn off “Auto scale.”
14. Double-click on one of the numbers on the “Value axis” (y-axis), then go to “Scale” and enter a reasonable “minimum” and “maximum” value, plus a “major unit” that will divide the scale into a nice set of numbered tick marks. Again, select the “Font” tab so that you can change the font size to ~12 pt and turn off “Auto scale.”
15. Double-click on the y-axis label. Change the font to ~12 pt bold and turn off “Auto scale.” Click “OK” and repeat for the x-axis label.
16. Double-click on your second line, and change the “Style” of the line to something other than a solid line; repeat this step for any additional lines, making sure that each is a different style so that you can clearly tell them apart when printed in black and white (you might also want to change one or more of their markers, which you can also do by double-clicking on the lines themselves and playing with the options available to you)
17. Finally, single-click just inside the outer edge of the graph itself to select the entire graph. From the “Format” menu, choose “Format chart area” and then select “none” under “Border.”
18. *If you are doing more than simply illustrating the pattern of results for an interaction, you should add error bars.* Double-click on one of the lines, select the “Y error bars” tab, click on the “Custom” selection in its “+” area, then use the red arrow pointing toward the upper left to go to the spreadsheet and highlight the cells containing the standard errors that correspond to the line you’ve selected (be careful to get the correct match of standard errors and means plotted on the line; once they’re highlighted, use the red arrow pointing downward to accept this selection), then repeat this procedure to enter the same series of standard errors for the “-” section of the “Custom” area, and click “OK”

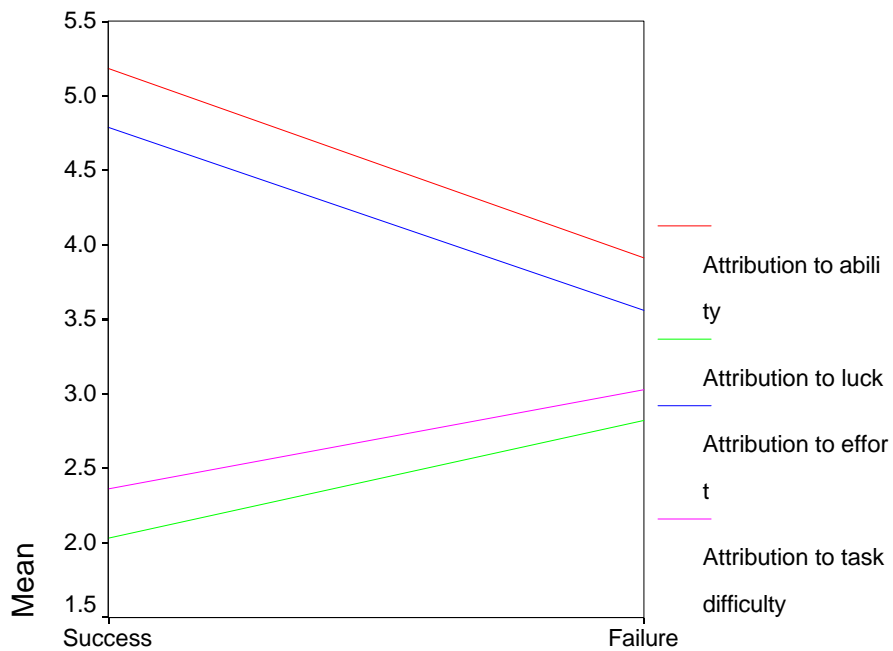
Descriptive Statistics

	Mean	Std. Deviation	N
Attribution to ability	4.54	1.691	67
Attribution to luck	2.43	1.681	67
Attribution to effort	4.16	1.746	67
Attribution to task difficulty	2.70	1.314	67



Descriptive Statistics

	Feedback condition 1=succ 2=fail	Mean	Std. Deviation	N
Attribution to ability	Success	5.18	1.380	33
	Failure	3.91	1.747	34
	Total	4.54	1.691	67
Attribution to luck	Success	2.03	1.447	33
	Failure	2.82	1.817	34
	Total	2.43	1.681	67
Attribution to effort	Success	4.79	1.409	33
	Failure	3.56	1.845	34
	Total	4.16	1.746	67
Attribution to task difficulty	Success	2.36	.822	33
	Failure	3.03	1.605	34
	Total	2.70	1.314	67



Feedback condition 1=succ 2=fail

