

ANOVA in Excel 2016

You should already have the Excel tutorial file open and the Birth Order and Phone Time variables copied into a new sheet and the data sorted by Birth Order.

1. Create four column titles called pt_oldest, pt_middle, pt_youngest, and pt_only
2. Copy the phone time data for oldest children into the pt_oldest column
3. Copy the phone time data for middle children into the pt_middle column
4. Copy the phone time data for youngest children into the pt_youngest column
5. Copy the phone time data for only children into the pt_only column

H	I	J	K	L
pt_oldest	pt_middle	pt_youngest	pt_only	
25	1.5	12	4.5	
23	30	50	12	
13	1	10	4	
23	10	30	20	
40	8	2	2.5	
50	30	10	1	
30	12	1.5	60	
27	15	10		
22	10	20		
35	17	19		
45	5	7		
21	4	4		

Excerpt of data

6. Select the Data tab and choose the Data Analysis in the top right hand corner
7. In the Data Analysis menu choose ANOVA: Single Factor and click OK
8. In the 'Input Range' box, select all the data in the columns you created in steps 2-5, including the variable names
9. Check the 'Labels in First Row' box
10. In the 'Output Range' box, enter a cell range where Excel will place the output (for example, use cells J2:P13) and click OK
11. If the p-value were less than 0.05, you would reject the null hypothesis that says the means of all categories are equal. If the p-value were greater than 0.05, then you would fail to reject the null.

Here is what the output should look like once you have completed steps 1-10:

Anova: Single Factor				
SUMMARY				
Groups	Count	Sum	Average	Variance
pt_oldest	25	605	24.2	112.0833
pt_middle	17	212.5	12.5	85.1875
pt_youngest	26	385.5	14.82692	196.4388
pt_only	7	104	14.85714	440.3929

Summa

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1781.518	3	593.8395	3.632725	0.016873	2.733647
Within Groups	11606.33	71	163.4694			
Total	13387.85	74				

p-va

F-statistic for ANOVA

Summary table of 4 data columns

p-value for ANOVA

F-statistic for ANOVA

Post Hoc Testing

If you determine from your ANOVA: Single Factor test that you have a significant F-statistic, you will need to conduct follow up testing to determine which groups significantly differ on the variable of interest.

You should have your file setup as in steps 1-5 above.

- Determine the number of pairwise comparisons you will need to run. This formula is: $(\text{number of groups})(\text{number of groups} - 1)/2$ for our data that is: $=4*(4-1)/2$ for a total of 6 comparisons
- Begin by comparing the only child and youngest child groups.
 - Select the Data tab and choose Data Analysis in the top right hand corner
 - Choose 't-test: Two-Sample Assuming Unequal Variances' in the Data Analysis menu
 - In the 'Variable 1 Range' box select the data in the pt_only column including the variable name
 - In the 'Variable 2 Range' box select the data in the pt_youngest column including the variable name
 - Set the 'Hypothesized Mean Difference' to 0
 - Check the Labels box

- g. In the output range, enter the cells where excel will place the output (for example, L7:N20) and click OK
- 3. Repeat this procedure in step 2 for the rest of the group comparisons: only vs. middle, only vs. oldest, young vs. middle, young vs. oldest, middle vs. oldest. Be sure to not overwrite your data from a previous test.
- 4. After completing the six tests we can determine which groups are significantly different by applying the Bonferroni correction. Due to the fact we performed six tests, our error rate may have increased. To account for this, instead of comparing the p-values to an alpha of .05 you should compare to a Bonferroni correct alpha by dividing α /(number of tests performed). For this example that is $=.05/6$ for a corrected alpha of .008.
- 5. Looking at the 'P(T<=t) two-tail row', compare each p-value to our Bonferroni corrected alpha to determine which groups significantly differ on the variable of interest, here phone time.