

### Analysis of Variance and Post-hoc

1. Perform a 2 x 2 factorial analysis of variance on the data below. Is there a significant main effect for A, a significant main effect for B, a significant A x B interaction? Use alpha = .05. Report your results in a summary table.

		Factor B	
		B1	B2
Factor A	A1	9	7
		7	8
		7	5
		5	4
	A2	6	3
		6	3
		4	4
		4	2

Summary Table				
Source	df	SS	MS	F
Between	3	35		
A	1	25	25	12.5
B	1	9	9	4.5
A x B	1	1	1	.5
Within	12	24	2	
Total	15	59		

f crit = 4.75

F critical values for A, B, and A x B are all 4.75 based on (1, 12) degrees of freedom. There is a significant main effect for A,  $F(1, 12) = 12.5$ ,  $p < .05$ . There is no significant main effect for B,  $F(1, 12) = 4.5$ ,  $p > .05$ . There is not a significant A x B interaction,  $F(1, 12) = .50$ ,  $p > .05$ .

2. Perform a 3 x 2 factorial analysis of variance on the data below using alpha = .05. Report your results in a summary table. Report, in APA format, whether any significant main effects or interactions emerged.

		Factor B		
		B1	B2	B3
Factor A	A1	1	4	8
		3	3	6
	A2	1	3	8
		4	6	10
		8	1	1
		6	6	3
		6	8	1
		8	1	4

Summary Table					
Source	df	SS	MS	F	f critical
Between	5	116.4			
A	1	.65	.65	.17	4.41
B	2	5.06	2.53	.65	3.55
A x B	2	110.69	55.34	14.33	3.55
Within	18	69.4	3.86		
Total	23	185.8			

The results indicated no significant main effect for A,  $F(1, 18) = .17, p > .05$ , no significant main effect for B,  $F(2, 18) = .65, p > .05$ , but a significant A x B interaction,  $F(2, 18) = 14.33, p < .05$ .

3. Calculate a repeated-measures analysis of variance on the data below representing the number of driving errors across 3 times. Participants were tested with a blood alcohol level of 0.0, a blood alcohol level of .08, and a blood alcohol level of .16. The same subjects participated in all 3 groups.

	level = 0.0	level = .08	level = .16
0		1	2
2		5	5
1		2	6
5		4	9
2		8	8

Summary Table

Source	df	SS	MS	F
treatment	2	40	20	8.0
within	12	74		
BS	4	54		
error	8	20	2.5	
Total	114	14		

For a repeated measures design, the F critical is 4.46. Therefore, there is a significant difference in errors across groups,  $F(2, 8) = 8.0, p < .05$ .

4. Below are the means and n's for 3 treatment groups along with the anova summary table. Conduct a Tukey's post-hoc test to determine which groups differ significantly from one another.

	treatment		
1	2	3	
M = 1	M = 5	M = 3	
n = 4	n = 4	n = 4	

	summary table			
Source	df	SS	MS	F
between	2	32	16	4.0
within	9	36	4	
total	11	68		

$q = 3.95, HSD = 3.95$ , therefore group 1 differs significantly from group 2. No other differences are significant.

5. Use the data below to calculate the following:  
 (1) conduct a oneway anova on the data and provide a summary table. Is there a significant difference between the four groups. Use alpha = .05.  
 (2) If appropriate, conduct a Tukey's post-hoc test to determine which groups differ significantly from one another using alpha = .05.

group 1	group2	group3	group4
4	0	3	0
6	2	1	2
2	2	2	1
4	0	2	1

summary table				
Source	df	SS	MS	F
between	3	24	8	6.0
within	12	16	1.33	
total	15	40		

$F(3, 12) = 6.0, p < .05.$

$q = 4.20, HSD = 2.42$  Therefore, group 1 differs significantly from groups 2 and 4. No other differences are significant.

6. Here is data involving the time (in seconds) that infants will look at a stimulus that is presented to them. The same stimulus is presented to each infant on three occasions. Conduct a repeated measures anova to determine if the length of time spent gazing at an object changes across trials.

infant	time 1	time 2	time 3
A	112	81	20
B	97	35	42
C	82	58	27
D	104	70	39
E	78	51	46

summary table				
Source	df	SS	MS	F
treatment	2	9048.4	4524.2	19.39
within	12	2552		
BS	4	685.06		
error	8	1866.94	233.37	
total	14	11600.4		