Help with Unit 3 Exam Demo

Two pages of the Exam 3 Demo (the kBG page 3 and the kChi page 4) have a kind of video file ".swf" that many operating systems and browsers no longer support.

So, here are two options"

#1 here's a link to where you can download an app that will play the the files.

The app was created by the folks who invented this file type (Adobe) and "howtogeek" has been around a long time -- safe stuff! I got the app downloaded and running quickly (and I'm not great at things like that!)

https://www.howtogeek.com/438141/how-to-play-adobe-flash-swf-files-outside-your-web-browser/

#2 the pages that follow take you through those items (b, d, e & h) of each page.

(b) To find the LSDmmd N = _____ , the number of conditions is _____ and n is _____ . The dferror is _____ and the MSerror is _____ (rounded to 2 decimals).

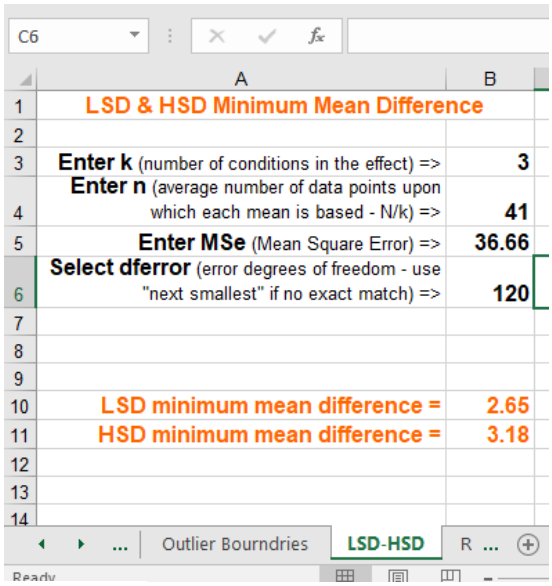
Using these values the LSDmmd is found to be _____ (rounded to 2 decimals).

We'll need these picture and the Computator to do this!

Descriptives

problems

	N	Mean	Std. Deviation
cogbeh	43	19.0204	5.68950
meds	32	20.4894	6.51848
cb-meds	48	15.4733	6.05429
Total	123	18.0183	6.36912



ANOVA

problems

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	549.492	2	274.746	7.494	.002
Within Groups	4399.525	120	36.663		
Total	4949.017	122			

N is given in the "Descriptives" -- the total number of people in all conditions = 123

k is the number of contions – cogbeh, meds & cb-meds → so k = 3

n is the average number of participants in each condition → k = N / k = 123 / 3 = 41

remember: if the answer isn't a whole number, use the decimal part in the computation of the LSDmmd

dferror is in the "df" column and the "Within Groups" row → 120

remember: if the exact value isn't among the drop-down values in the computator, round down to the next lower value

MSerror is in the "Mean Square" column and the "Within Groups" row → MSerror is 36.66

We plug those numbers in to the Computator and get the LSDmmd → 2.65

(d) The effect size for the pairwise comparison of the cogbeh and meds conditions is _____, the effect size for the pairwise comparsion of cogbeh and cbmeds is _____ and the effect size for the pairwise comparison of meds and cbmeds is _____ (use 2 decimals to calculate and report the effect size - always report the effect size as positive).

We'll need these picture and the Computator to do this!

Descriptives

problems

	N	Mean	Std. Deviation
cogbeh	43	19.0204	5.68950
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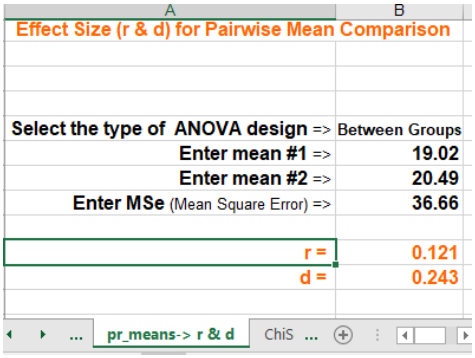
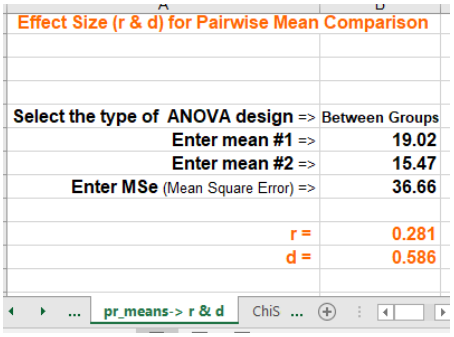


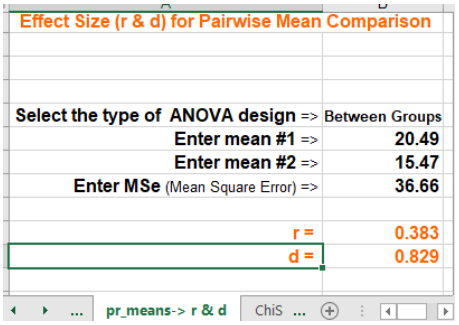
Effect Size (r & d) for Pairwise Mean Comparison	
Select the type of ANOVA design =>	Between Groups
Enter mean #1 =>	19.02
Enter mean #2 =>	20.49
Enter MSe (Mean Square Error) =>	36.66
r =	0.121
d =	0.243

pr_means-> r & d | ChiS ...



Effect Size (r & d) for Pairwise Mean Comparison	
Select the type of ANOVA design =>	Between Groups
Enter mean #1 =>	19.02
Enter mean #2 =>	15.47
Enter MSe (Mean Square Error) =>	36.66
r =	0.281
d =	0.586

pr_means-> r & d | ChiS ...



Effect Size (r & d) for Pairwise Mean Comparison	
Select the type of ANOVA design =>	Between Groups
Enter mean #1 =>	20.49
Enter mean #2 =>	15.47
Enter MSe (Mean Square Error) =>	36.66
r =	0.383
d =	0.829

pr_means-> r & d | ChiS ...

For these three condtions, there would be three pairwise comparison:
#1 Cogbeh vs meds #2 cogbeh vs cb-meds #3 meds vs. cb-meds

For each pairwise comparison we enter the means for the two groups and the MSerror.

MSerror is in the "Mean Square" column and the "Within Groups" row → MSerror is 36.66

Above shows how the computator would be used for each of the three pairwise comparisons.

The answers (rounded to two decimals) would be
#1 Cogbeh vs meds r = .12 #2 cogbeh vs cb-meds r = .28 #3 meds vs. cb-meds r = .38

(e) For the pairwise comparison of the cognitive behavioral and the medication conditions, based on the LSDmmd, the probability of a Type I error would be (Click for List) the probability of a Type II error would be (Click for List) and the probability of a Type III error would be a (Click for List) .

We're comparing cogbeh vs. meds, with means of 19.02 & 20.49, so the mean difference is 1.47.

We calculated the LSDmmd in "b"above.

The mean difference of 1.47 Is less than the LSDmmd of 2.65, so we would Retain H0: for this particular pairwise comaprions. Now we can answer the question!

Having retained H0:, a Type I error and a Type II error are both "not possible"

To estimate the probability of making a Type II error, we have to do the "dance of the Type II error"

We need r & S to go to the power table to get the power of the study. From that power estimate, we'll estimate the probability of a Type II error.

We know that r = .12 (we found that in "d" above)

We know that n = 41 (we found that in "b" above). S = n * 2 so S = 82

Now we need the power table!

r ?	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
? power													
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
.50	382	170	95	60	42	30	23	18	14	12	9	8	7
.60	488	257	143	90	62	45	34	24	20	16	13	11	9
.70	613	300	167	105	72	52	39	29	23	28	15	12	10
.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

We would round r = .12 to r = .10 to use the power table.

For r = .10 & S = 82, there isn't even an entry on the table! 20% power for r=.10 needs 124 folks.

1 – power = probability of a Type II error. So, we have less than 20% power which translates to more than 80% chance of a Type II error

h) We are planning a replication study and want to risk only a 20% chance of missing an effect. Estimate the appropriate sample size for that study, based on the smallest pairwise effect size from the current study. The number of participants in that pairwise comparison should be (S) = _____ , the number of participants in each condition of the study should be (n) = _____ and the total number of participants in the study should be (N) = _____ .

So, last one…

The pairwise comparison with the smallest effect is the Cogbeh vs meds r = .12

We'd round that down to r = .10 to use the power table.

r ? / ? power	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
.50	382	170	95	60	42	30	23	18	14	12	9	8	7
.60	488	257	143	90	62	45	34	24	20	16	13	11	9
.70	613	300	167	105	72	52	39	29	23	28	15	12	10
.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

If we're willing to take a 20% risk of a Type II error, we will want 80% power.

For r = .10 & .80 power, we'd need S = 781 participants in the two conditions of that pairwise comparison.

With S = 781, then n = S / 2 = 781 / 2 = 390.5, or 391 people in each condition of the study (rounding the fraction up).

With n = 391 and k = 3 conditions, then N = n * 3 = 391 * 3 = 1173 people in the whole study!

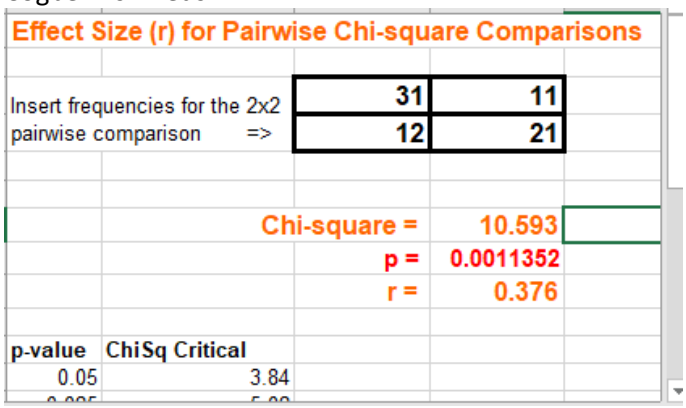
On to the Chi-square stuff on page 4…

(b) The pairwise comparison of the cogbeh vs. meds conditions has a Chi-square (rounded to 2 decimals) of _____, for cogbeh vs. cb-meds has a Chi-square (rounded to 2 decimals) of _____ and the comparison of meds and cbmeds has a Chi-square (rounded to 2 decimals) of _____. The Chi-square critical value for all these pairwise comparisons (rounded to 2 decimals) is _____.

To do this, we'll need the computator for the first three.

For each pairwise, we enter the cell frequencies for

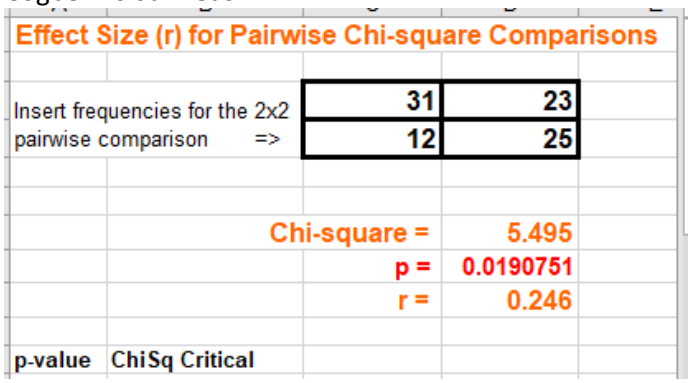
Cogbeh vs. Meds



Effect Size (r) for Pairwise Chi-square Comparisons		
Insert frequencies for the 2x2 pairwise comparison =>	31	11
	12	21
Chi-square =	10.593	
p =	0.0011352	
r =	0.376	

p-value	ChiSq Critical
0.05	3.84

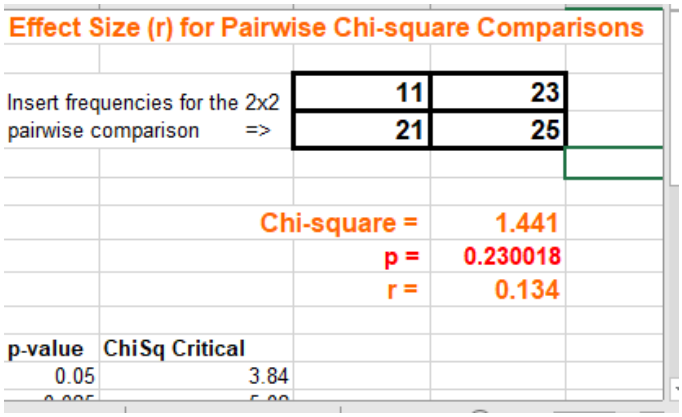
Cogbeh vs cb-meds



Effect Size (r) for Pairwise Chi-square Comparisons		
Insert frequencies for the 2x2 pairwise comparison =>	31	23
	12	25
Chi-square =	5.495	
p =	0.0190751	
r =	0.246	

p-value	ChiSq Critical

Meds vs. cb-meds

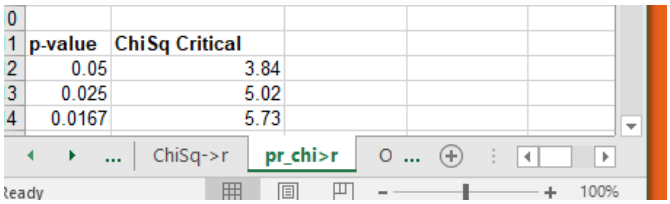


Effect Size (r) for Pairwise Chi-square Comparisons		
Insert frequencies for the 2x2 pairwise comparison =>	11	23
	21	25
Chi-square =	1.441	
p =	0.230018	
r =	0.134	

p-value	ChiSq Critical
0.05	3.84

The critical value for a 2x2 Chi-square for testing at the conventional "uncorrected" p = .05 is always 3.84.

That value is shown in the computer.



	p-value	ChiSq Critical
0		
1		
2	0.05	3.84
3	0.025	5.02
4	0.0167	5.73

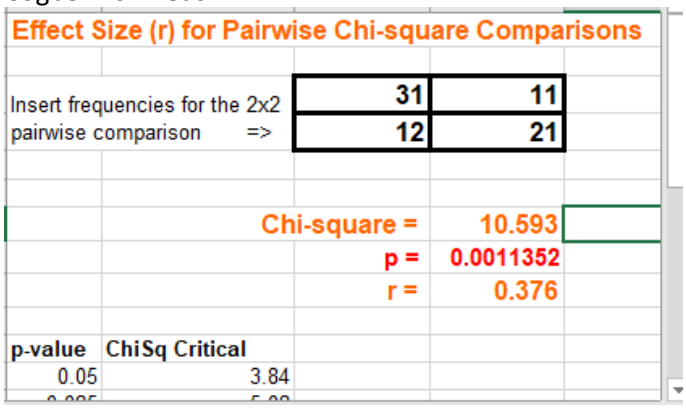
... ChiSq->r pr_chi>r O ... Ready 100%

(d) The effect size for the pairwise comparison of cogbeh and meds is _____, the effect size for the pairwise comparsion of cogbeh and cbmeds is _____ and the effect size for the pairwise comparison of meds and cbmeds is _____ (use 2 decimals to calculate and report the effect size - always report the effect size as positive).

The computator also calculates the effect size for each pairwise comparison. So, we got these values when we did "b".

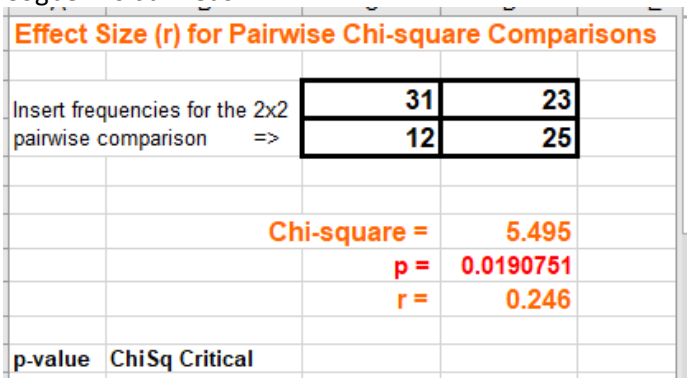
The "trick" is to remember to collect these when you're doing "b" – I usually forget have to go back and do them again – aaarrrgghh!

Cogbeh vs. Meds



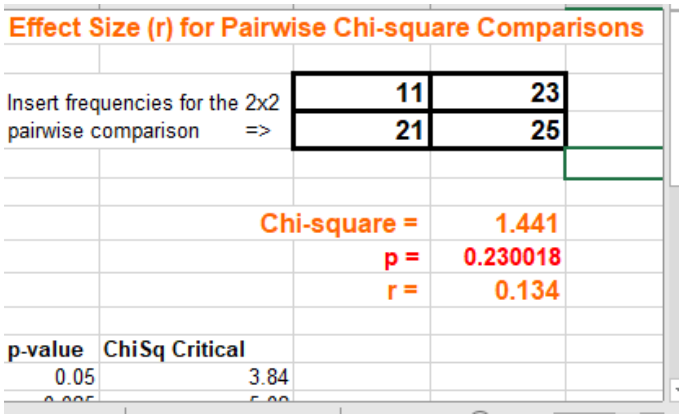
Effect Size (r) for Pairwise Chi-square Comparisons		
Insert frequencies for the 2x2 pairwise comparison =>	31	11
	12	21
Chi-square =	10.593	
p =	0.0011352	
r =	0.376	
p-value	ChiSq Critical	
0.05	3.84	

Cogbeh vs cb-meds



Effect Size (r) for Pairwise Chi-square Comparisons		
Insert frequencies for the 2x2 pairwise comparison =>	31	23
	12	25
Chi-square =	5.495	
p =	0.0190751	
r =	0.246	
p-value	ChiSq Critical	

Meds vs. cb-meds



Effect Size (r) for Pairwise Chi-square Comparisons		
Insert frequencies for the 2x2 pairwise comparison =>	11	23
	21	25
Chi-square =	1.441	
p =	0.230018	
r =	0.134	
p-value	ChiSq Critical	
0.05	3.84	

(e) For the pairwise comparison of meds and cbmeds, based on the pairwise Chi-square, the probability of a Type I error would be (Click for List) the probability of a Type II error would be (Click for List) and the probability of a Type III error would be a (Click for List) .

For the pairwise comparison of meds and cbmeds, we retained the null hypothesis ($p > .05$). With that decision we can go to work on this question.

If we retain H0", then both a Type I Error and a Type III Error are "not possible".

To estimate the probability of making a Type II error, we have to do the "dance of the Type II error"

We need r & S to go to the power table to get the power of the study. From that power estimate, we'll estimate the probability of a Type II error.

We know that r = .13 (we found that in "d" above)

To calculate "S" we start with N=123 people in the whole study.

From that we calculate n = N / k = 123 / 3 = 41

And from that we can calculate S = n * 2 = 41 * 2 = 82

Now we need the power table!

r ? ? power	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
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.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

We would round r = .13 to r = .10 to use the power table.

For r = .10 & S = 82, there isn't even an entry on the table! 20% power for r=.10 needs 124 folks.

1 – power = probability of a Type II error. So, we have less than 20% power which translates to more than 80% chance of a Type II error

(h) We are planning a replication study and have decided that the pairwise comparison we are most interested in involves the cbmeds and cogbeh conditions. If we want sufficient power for this comparison, he number of participants in that pairwise comparison should be (S) = [ ] , the number of participants in each condition of the study should be (n) = [ ] and the total number of participants in the study should be (N) = [ ] .

The effect size for the cb-meds and cogbeh pairwise comparison is r = .246.

We would round that to r = .25 to use the power table

r ?	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
? power													
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
.50	382	170	95	60	42	30	23	18	14	12	9	8	7
.60	488	257	143	90	62	45	34	24	20	16	13	11	9
.70	613	300	167	105	72	52	39	29	23	28	15	12	10
.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

The problem does not mention a specific amount of power, nor a specific acceptable risk of a Type II error, so we would use the "industry standard" for power → 80% power

For r = .25 & .80 power, we'd need S = 120 participants in the two conditions of that pairwise comparison.

With S = 120, then n = S / 2 = 120 / 2 = 60.

With n = 60 and k = 3 conditions, then N = n * 3 = 60 * 3 = 180 people in the whole study!