PSYC 610 – One-way ANOVA problems

1. An investigator is interested in the effects of stress on reaction time. She gives a reaction time test to three groups of subjects: one group that is under a great deal of stress, one group under a moderate amount of stress, and a third group that is under almost no stress. Theory A suggests that subjects under a moderate amount of stress will perform better than subjects in either the very low or the very high stress groups. Theory B predicts that subjects in the high stress group will perform better than subjects in either the low stress or the moderate stress groups. Theory C predicts that subjects in the moderate stress condition will perform significantly more poorly than subjects in the low stress condition.

    a.   Using an alpha level of .05, please use SPSS to perform the overall ANOVA and then determine whether the data below provide evidence for Theory A, Theory B, or Theory C.

    b.   Please write a paragraph that summarizes the conclusions that the investigator is entitled to draw from these results. In this paragraph, be sure to make it clear how you handled the issue of conducting three planned comparisons. Also provide the ANOVA table for these results.

    c.   Are the comparisons indicated above orthogonal?

a1 High Stress	a2 Moderate Stress	a3 Low Stress
6	8	10
7	10	11
4	11	8
5	7	6
6	12	13
3	11	12

2. An investigator is interested in the effects of noise on the ability of subjects to concentrate. She assigns subjects randomly to one of three Noise conditions: low noise, moderate noise, and loud noise. She administers a test of concentration while the noise is present. She predicts that there will be an overall effect of noise on the ability to concentrate. Theory A suggests that people in the low noise condition will have higher scores on concentration than subjects in the moderate noise condition, but that no difference in concentration will be observed between subjects in the moderate and loud noise groups. Theory B suggests that subjects in the moderate noise condition will have higher concentration scores than subjects in loud noise condition, but that no difference in concentration will be observed between subjects in the low noise and moderate noise conditions.

    a.   Please use SPSS to test the investigator's prediction of an overall effect of noise on the ability to concentrate and the comparisons that she should conduct to determine whether Theory A or Theory B is better supported by the data.

    b.   Please write a paragraph that presents the conclusions that the investigator is entitled to draw from the results of these tests. Also provide the ANOVA table for these results.

Low Noise	Moderate Noise	Loud Noise
10	5	6
11	4	3
13	4	3
12	5	5

3. An investigator is interested in the effects of sleep deprivation on memory function. He randomly assigns each of 20 participants to one of four groups. Five subjects take a test of memory function after they have been awake for eight hours (No sleep deprivation). Five subjects take the test after they have been awake for 18 hours (mild sleep deprivation). Five subjects take the test after they have been awake four 24 hours (moderate sleep deprivation). Five subjects take the test after they have been awake for 48 hours (severe sleep deprivation). Higher scores on the test of memory function indicate higher levels of performance.

The investigator predicts that an overall effect of sleep deprivation on memory function will be observed. He predicts that people with at least some sleep deprivation will perform significantly more poorly than people who have not been sleep deprived. He also predicts that people who have been deprived of sleep for 24 hours will perform significantly more poorly than people who have been deprived of sleep for 18 hours. He also predicts that people who have been deprived of sleep for 48 hours will perform significantly more poorly than people who have been deprived of sleep for 24 hours.

Please use SPSS to test each of the predictions of the investigator. Please describe the results of these tests in a paragraph written in APA-style for a results section. Please report all tests as F-tests.

Please hand in your paragraph describing the results, the ANOVA table containing the results for each F-test, a printout of the spreadsheet containing your data, and a printout of your output window.

No deprivation a1	18 hours deprivation a2	24 hours deprivation a3	48 hours deprivation a4
23	16	8	15
19	14	7	12
17	12	9	14
20	11	10	13
25	14	6	13

4. An investigator is interested in the effects of stress on memory. He assigns subjects to one of three levels of stress: low, moderate, and high. The dependent variable is the number of words that subjects can correctly remember from a list of 20 words. The investigator predicts that there will be an effect of stress on memory function. Anticipating a significant overall effect, she also predicts that (a) subjects in the moderate stress condition will perform better than subjects in the low stress condition and that (b) subject in the moderate stress condition will perform better than subjects in the high stress condition.

a. Please use SPSS to test the investigator's predictions.

b. Please write a paragraph that presents the conclusions that the investigator is entitled to draw from the results of these tests.

Low Stress   Moderate Stress   High Stress

Low Stress	Moderate Stress	High Stress
5	9	5
4	10	6
3	8	3
4	11	5

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5. An investigator conducts an ANOVA with four levels of the independent variable. She wants to conduct five planned comparisons. Why would an investigator consider applying the Bonferroni adjustment in this situation? Please show your work in calculating the value that the researcher needs in order to use the Bonferroni adjustment in this example.

6. An investigator is interested in the effects of a new drug for children with Attention Deficit Disorder. She administers a test of the ability to maintain attention while performing a task to 24 fifth graders with a diagnosis of Attention Deficit Disorder. Higher scores reflect a better ability to maintain attention. Six of these students receive a placebo containing none of the drug. Six students receive 2 mg of the drug, six students receive 4 mg of the drug, and six students receive 6 mg of the drug. The investigator predicts that there will be an overall effect of the drug on the ability to maintain attention. The investigator also predicts that children with ADD who receive the drug will perform significantly better than children with ADD who do not receive the drug. Children who receive either 4 mg or 6 mg of the drug are predicted to perform significantly better than children who receive 2 mg of the drug. Children who receive 6 mg of the drug are predicted to perform significantly better than children who receive 4 mg of the drug.

Please use SPSS to test each of the predictions of the investigator. Please describe the results of these tests in a paragraph written in APA-style for a results section. What overall conclusion about the effects of the drug on the ability to maintain attention should the investigator draw?

Please hand in your paragraph describing the results, a printout of the spreadsheet containing your data, and a printout of your output window.

In addition…

a. What is Fmax for this data set? What do you conclude on the basis of the information provided by Fmax?

b. If the investigator wanted to conduct unplanned (post hoc) comparisons using the Tukey Method, what would the critical value for F be? Please show your work in calculating this value.

No Drug	2 mg	4 mg	6 mg
a1	a2	a3	a4
4	7	16	17
7	8	14	18
11	13	12	13
11	6	11	17
7	9	15	20
10	9	13	15