

NAME:

Answer the following questions showing all work. Full credit will not be given to answers without work shown. **If you use Minitab Express or StatKey include the appropriate output (copy + paste).** If you do hand calculations show your work using the Word equation editor. Clearly identify your final answers. Output without explanation will not receive full credit and answers with no output or explanation will not receive full credit. Round all answers to 3 decimal places. If you have any questions, post them to the course discussion board.

This lab assignment uses the data file **FootballBrain.MTW** which contains data from three groups: football players who had a concussion, football players who have had a concussion, and a control group who has never played football. The variable "**Hipp**" is the hippocampus volume (in microliters).

1. Use **Minitab Express** to compute the mean and standard deviation for each of the three groups.
2. Which group has the largest mean hippocampus volume?
3. Use **Minitab Express** to construct **side-by-side boxplots** to compare hippocampus volumes across the three groups.
4. Which group has the largest median hippocampus volume?
5. Explain why a one-way ANOVA should be conducted to compare the mean hippocampus volumes of these three groups as opposed to a series of three independent means t tests.
6. In **StatKey**, under "**More Advanced Randomization Tests**," conduct an "**ANOVA for Difference in Means**." Copy and paste the "Group" and "Hipp" columns from Minitab Express into StatKey. Conduct a randomization test using the default null hypothesis that the three population means are all equal. Use the five-steps given and remember to include screenshots of all relevant StatKey output.

Step 1: State hypotheses

Step 2: Construct a randomization dotplot

Step 3: Find the p-value

Step 4: Make a decision (reject or fail to reject the null)

Step 5: State a real world conclusion

7. Use **Minitab Express** to conduct a **one-way ANOVA** to compare the mean hippocampus volumes of the three groups. Use the five-step hypothesis testing procedure.

Step 1: State hypotheses and check assumptions

Step 2: Compute the test statistic

Step 3: Determine the p-value

Step 4: Make a decision (reject or fail to reject the null)

Step 5: State a real world conclusion

8. How were your results in parts 6 and 7 similar? Explain why they were similar.

9. Use **Minitab Express** to conduct Tukey simultaneous tests for differences in means. Remember to include your relevant output here. Which pairs are different and which pairs are not different?

10. How would you explain the results of your overall one-way ANOVA in part 7 and Tukey pairwise comparisons in part 8 to a friend with very little knowledge of statistics?

11. From these results, we can conclude that playing football or having a conclusion **causes** smaller hippocampus volumes? Why or why not?

EXTRA [10 points]

In Spring 2016 a representative sample of World Campus STAT 200 students were surveyed and asked if they prefer to watch curling, figure skating, or ice hockey on television in the winter. They were also asked how many hours per week they typically exercise. Use the information given to answer the following questions.

Means

Winter Sport	N	Mean	StDev	95% CI
Curling	41	3.8049	4.3944	(2.2787, 5.3311)
Figure skating	178	4.1601	5.9770	(3.4276, 4.8926)
Ice hockey	300	4.3217	4.3555	(3.7575, 4.8859)

Pooled StDev = 4.97432

A. Fill in all of the blank cells in the ANOVA source table above.

Source	SS	df	MS	F	p
Between Groups	10.8	3-1=2			
Within Groups	12767.8		24.74		
Total	12778.6				

B. Use the five-step hypothesis testing procedure to determine if there is evidence that the mean number of hours exercised per week is not equal for students who prefer these three winter sports.