

## Handout 9: HW

Points: 25

Researchers at a trauma center wished to develop a program to help brain-damaged trauma victims regain an acceptable level of independence. The study was able to recruit a total of 18 people who at the start of the study had a similar level of brain damage from some type of traumatic event. The 18 people were randomly assigned to one of the six treatment combinations.

### Treatments

- Physical Therapy Program - identified simply as PhyTherapy1 and PhyTherapy2
- Psychiatric Treatment Program- identified simply as PsyTreatmentA, PsyTreatmentB, and PsyTreatmentC

Response Variable: Months - the number of months elapsing between initiation of therapy/treatment and time at which the patient was able to function independently.

### Data

The data from this study is provided in the BrainDamage dataset. The data is also provided in the table below.

Physical Therapy	Psychiatric Treatment		
	TreatmentA [PsyTreatmentA]	TreatmentB [PsyTreatmentB]	TreatmentC [PsyTreatmentC]
Program 1 [PhyTherapy1]	12, 11.5, 11.8	11.5, 11.5, 12.3	11.8, 11.8, 12.3
Program 2 [PhyTherapy2]	11.5, 11.8, 10.5	9.4, 9.1, 10.8	13.7, 13.5, 12.5

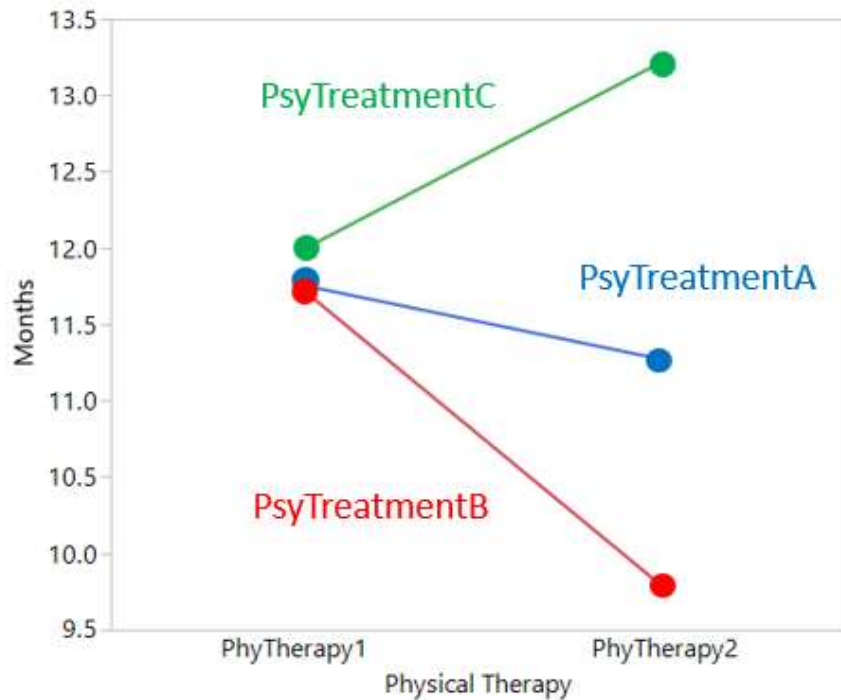
### Statistical Model

$$y_{ijk} = \mu + \alpha_i + \theta_j + \gamma_{ij} + \varepsilon_{ijk}$$

where

- $\mu$  : overall effect
- $\alpha_i$  : effect due to Physical Therapy,  $i = 1, 2$
- $\theta_j$  : effect due to Psychiatric Treatment,  $j = 1, 2, 3$
- $\gamma_{ij}$  : interaction effect, i.e. effect due to the combination of Physical Therapy and Psychiatric Treatment
- $\varepsilon_{ijk}$  : residual or error for each observation,  $k=1,2,3$

Consider the following plot that displays the averages from each treatment combination.



1. Does this graph support or refute the notion that an interaction effect is likely to be significant for this data? Briefly discuss. (3 pts)
2. Obtain the output necessary to complete the following test in JMP and paste it below. Obtain the p-value for this test and write a conclusion using everyday language. (4 pts)

Overall Hypothesis Test in words...

$H_0$  : The factors Physical Therapy and /or Psychiatric Treatment have no effect

$H_A$  : The factors Physical Therapy and /or Psychiatric Treatment have some effect

Copy / paste appropriate JMP output here

P-Value:

Conclusion:

Handout 9: HW

Points: 25

Next consider the output obtained under Effect Test. Delete the sample output here and copy/paste your output in its place.

*Delete the sample output here and copy/paste your Effect Tests output*



Source	Np	D	Sum of Squares	F Ratio	Prob > F
SAMPLE					

3. Using the Effect Tests output, conduct all relevant statistical tests necessary for this analysis.
  - a. Write out the null and alternative hypothesis test for each test that you plan to conduct. (3 pts)
  - b. What is the p-value for each test you conducted? (1 pt)
  - c. Write a conclusion, using layman's language, for each test you conducted. (3 pts)
  
4. Use Tukey's HSD multiple comparison procedure to determine which treatment combinations are significantly different from others. Your analysis should include a Connecting Letters Report and Ordered Difference Report. (4 pts)

*Copy / paste appropriate JMP output here*

Provide sufficient discussion on what is learned from these reports.

5. In this study, the goal is to minimize the response, i.e. minimize the average months until independence. The researcher has asked the following question, "Is there a single best treatment combination that is statistically better than all others?". What is your answer to this question? Briefly discuss. (4 pts)
  
6. Verify the following ANOVA assumptions -- each can be verified graphically. Provide the appropriate graphic and include a brief discussion (3 pts).

- a. Constant Variance Assumption

*Copy / paste appropriate JMP output here*

- b. Normality Assumption

*Copy / paste appropriate JMP output here*