PC Lab 4 – Analysis of Variance and Post-Hoc testing

**ANOVA Exercises with SPSS**

The data set below shows data for a randomised controlled trial for research in child development using the Expressive Vocabulary Test, Third Edition (EVT-3) where the standard score is set to 100:

|  |  |  |
| --- | --- | --- |
| **Phonics-based education** | **Play-based education** | **No intervention** |
| 108 | 117 | 100 |
| 110 | 115 | 98 |
| 106 | 119 | 102 |
| 109 | 118 | 101 |
| 111 | 116 | 99 |

For the data above, complete the following instructions using SPSS where required.

1. State the null and alternate hypotheses of this test.
2. Write down the assumptions of the test.
3. Determine the test statistic
4. Paste into this word (below) document the ANOVA table. (Hint: you should paste files as image files)

**Analysing multiple data sets using ANOVA**

The following questions are designed to give you practice in using the one-way ANOVA. Open the Excel file called “Week 4 Data.xlsx”. Each sheet in the Excel file contains data for conducting a one-way ANOVA.

For each set of data below, analyse it carefully and complete the following instructions.

1. State the null and alternate hypotheses of this test.
2. Check the assumptions of this test.
3. Perform the appropriate analysis using SPSS.
4. Do you require post-hoc testing? Why or why not?
5. Report the results in APA7 format.

Potassium Levels

Potassium is an essential mineral that helps the body to function normally namely the heart, muscles and nerves. However, high potassium levels can lead to hyperkalemia and chronic kidney disease or kidney failure. Potassium levels (mmol/L) in blood are measured at 5 different hospital sites. Is there a difference in the mean potassium levels among all 5 hospital sites?

Human Diets

A study was conducted that followed three weight (in kg) loss dieting programs across a one-month trial. You are curious to see whether the diets were equally effective or not and decide to analyse the data using a one-way ANOVA.

FEV1 and COPD

The FEV1 value is an important parameter that is used to monitor chronic obstructive pulmonary disease (COPD). FEV is the forced expiratory volume and is a measure of how much air can leave your lungs in one second. This is often done through spirometry tests. You have the data of 4 hospital sites where the FEV1 value has been measured for numerous patients. Use a one-way ANOVA to see if there is a difference in the means of the FEV1 values among hospitals A, B, C and D.

Which data sets above were significant?

**Test your knowledge!**

A researcher analysed whether the average number of plastic wastes in hospitals per day was different in four Australian states. After testing, he found that the prerequisites (assumptions) had all been met, and the researcher tested the data using a one-way ANOVA. The SPSS output from this test is shown below. Answer the questions that follow.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ANOVA** | | | | | |
| Plastic\_Wastes | | | | | |
|  | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 110.600 | **B** | 36.867 | **D** | .455 |
| Within Groups | 4028.160 | **C** | 41.960 |  |  |
| Total | **A** | 99 |  |  |  |

* 1. What is the null hypothesis for this statistical test?
  2. Based on this output, should the researcher accept or reject this null hypothesis at α = 0.05? Explain your answer.

* 1. Four numbers have been removed from the SPSS output and replaced with letters. Next to the relevant letter, write the number that should have appeared in that spot.  
       
     **A**.   
       
     **B**.   
       
     **C**.

**D**.

Find the article below and read through it. Answer the questions that follow:

Lin, L. P., & Zakaria, N. S. (2013). Breast Cancer and Chemotherapy Knowledge among Undergraduates of Health Sciences: Which Traits Predict Good Knowledge?. *The Malaysian journal of medical sciences: MJMS*, *20*(1), 60.

1. How many groups were involved in the ANOVA test?

2. What were these groups?

3. What continuous data was being analysed?

4. What statistical software did they use to do the analysis?

5. The post-hoc test that was used was the Bonferroni adjustment. What do the authors mean when they say the “Bonferroni adjustment was used when necessary”. ie. What are they implying when they say “when necessary”?

**You may use the rest of this class to work on Assessment Task 1.**