Assignment 9: Repeated-Measures ANOVA

Use the following data to determine if an antipsychotic medication reduces schizophrenic symptoms.

Participants	Pre-treatment Symptoms (Week 0)	Post-treatment Symptoms (Week 2)	Post-treatment Symptoms (Week 4)	Means
1	3	1	0	1.33
2	3	2	0	1.67
3	2	2	1	1.67
4	3	2	0	1.67
Means	2.75	1.75	.25	1.58

SPSS Instructions

- On the bottom left, click Variable View.
- Enter 'Participants' in the first cell, 'Week0' in the cell below, 'Week2' in the cell below, and 'Week4' in the cell below.
- On the bottom left, click Data View. Enter the data.
- Click Analyze, Descriptive Statistics, Descriptives. Move Week0, Week2, and Week4 into the Variable(s) box on the right. Click OK.
- Click Analyze, General Linear Model, Repeated Measures.
- Replace 'factor1' by typing 'Week'. Enter 3 for Number of Levels. Click Add. Click Define.
- Move Week0, Week2, and Week4 into the Within-Subjects Variables box. Week0 should be beside (1), Week2 beside (2), and Week4 beside (3). Click OK.
- Save the Data file and Output file separately. Use informative file names.

SPSS Data

SPSS Output

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Week0	4	2.00	3.00	2.7500	.50000
Week2	4	1.00	2.00	1.7500	.50000
Week4	4	.00	1.00	.2500	.50000
Valid N (listwise)	4				

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Week	Sphericity Assumed	12.667	2	6.333	19.000	.003
	Greenhouse-Geisser	12.667	1.500	8.444	19.000	.007
	Huynh-Feldt	12.667	2.000	6.333	19.000	.003
	Lower-bound	12.667	1.000	12.667	19.000	.022
Error(Week)	Sphericity Assumed	2.000	6	.333		
	Greenhouse-Geisser	2.000	4.500	.444		
	Huynh-Feldt	2.000	6.000	.333		
	Lower-bound	2.000	3.000	.667		

Written Calculations

Show all work.

(1) Provide the notation for the null and research hypotheses and a written statement for the omnibus null hypothesis.

(2) Calculate F, provide a summary table, provide the result in APA format, and write a conclusion. Use α .01.

(3) Use Fisher's LSD to determine if there is a difference between Week 0 and Week 2, provide the result in APA format and write a conclusion. Use α .05.

(4) Use Cohen's d to determine the effect size for the difference between Week 0 and Week 4, and write a conclusion.

1. $H_0: \mu_0 = \mu_2 = \mu_4$
   $H_1: \mu_0 \neq \mu_2 \neq \mu_4$

   Omnibus null hypothesis: There is no statistically significant difference among the population means of psychotic symptoms.

2. $SS_{total} = \sum X^2 - \frac{(\sum X)^2}{N}$

   $\sum X^2 = 3^2 + 3^2 + 2^2 + 3^2 + 1^2 + 2^2 + 2^2 + 2^2 + 0^2 + 0^2 + 1^2 + 0^2 = 45$

   $(\sum X)^2 = (3 + 3 + 2 + 3 + 1 + 2 + 2 + 2 + 0 + 0 + 1 + 0)^2 = 361$

   $SS_{total} = 45 - \frac{361}{12} = \boxed{14.92}$

   $SS_{subjects} = t \sum (\bar{X}_{subjects} - \bar{X}_{gm})^2$

   $= 3[(1.33 - 1.58)^2 + (1.67 - 1.58)^2 + (1.67 - 1.58)^2 + (1.67 - 1.58)^2] = \boxed{.26}$

   $SS_{weeks} = n \sum (\bar{X}_{weeks} - \bar{X}_{gm})^2$
   $= 4[(2.25 - 1.58)^2 + (1.75 - 1.58)^2 + (.25 - 1.58)^2] = \boxed{12.67}$

   $SS_{error} = SS_{total} - SS_{subjects} - SS_{weeks}$

   $= 14.92 - .26 - 12.67 = \boxed{1.99}$

   Conclusion: There is a statistically significant difference.

3. $t_{ind} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{MS_{pool}(1/n_1 + 1/n_2)}} = 2.4559 \qquad t_{(6)} = 2.4559 > 1.9 \quad p < 0.05$

   There is a statistically significant difference between the symptoms of psychosis between week 2 and week 0 such that $2 < 0$.

4. $d = \frac{\bar{X}_1 - \bar{X}_2}{S_1} = \frac{2.5}{0.5} = 5$ Psychotic symptoms decreased 5 standard deviations from week 0 to week 4, indicating a strong effect.