Multivariate Analysis of Variance: MANOVA

Assignment.

G&W Chapter 13 &14
Kachigan, Chapter 5

Terms you should know.

MANOVA

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Bonferroni adjustment

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Wilks Lambda

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. . . .

Pillai's Trace

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. . . .
. . . .

Matrices

$SSCP_{Total}$

. . . .
. . . .
. . . .

$SSCP_{Between}$

. . . .
. . . .
. . . .

$SSCP_{Within}$

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. . . .
. . . .

Wilks' Lambda

. . . .
. . . .
. . . .

Pillai's Trace

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. . . .
. . . .

Box Test

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Formulas and Symbols You Should Know.

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η^2

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$$\frac{|W|}{|B+W|}$$

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. . . .

Computations You Should be Able to Perform.

A teacher was interested in a special training program designed to get middle school teachers to understand the levels of influence that affect childrens' classroom behavior. There were three levels of influence: Discipline Efficacy (perceived ability to use discipline effectively), External Influences (perceived ability to deal with external influences such as parents, siblings, etc.), and Teaching Efficacy (perceived ability to teach effectively). She did the training in one school and used a matched school as a control. The following tables represent her data analyses.

Table 1. Box's Test of Equality of Covariance Matrices

Box's M	2.998
F	.441
df1	6
df2	5680.302
Sig.	.852

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

Table 2. Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Eta Squared
Intercept	Pillai's Trace	.994	1354.496	3.000	26.000	.000	.994
	Wilks' Lambda	.006	1354.496	3.000	26.000	.000	.994
	Hotelling's Trace	156.288	1354.496	3.000	26.000	.000	.994
	Roy's Largest Root	156.288	1354.496	3.000	26.000	.000	.994
SCHOOL	Pillai's Trace	.269	3.183	3.000	26.000	.041	.269
	Wilks' Lambda	.731	3.183	3.000	26.000	.041	.269
	Hotelling's Trace	.367	3.183	3.000	26.000	.041	.269
	Roy's Largest Root	.367	3.183	3.000	26.000	.041	.269

Table 3. Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
Discipline Efficacy	.414	1	28	.525
External Influences	1.691	1	28	.204
Teaching Efficacy	.241	1	28	.627

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Talbe 4. Tests of Between-Subjects Effects

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	Sig	Eta Squared
Corrected Model	Discipline Efficacy	136.533	1	136.533	2.430	.130	.080
SCHOOL	Discipline Efficacy	136.533	1	136.533	2.430	.130	.080
	External Influences	974.700	1	974.700	7.912	.009	.220
	Teaching Efficacy	53.333	1	53.333	3.063	.091	.099
Error	Discipline Efficacy	1572.933	28	56.176			
	External Influences	3449.600	28	123.200			
	Teaching Efficacy	487.467	28	17.410			
Total	Discipline Efficacy	152372.000	30				
	External Influences	67079.000	30				
	Teaching Efficacy	34814.000	30				
Corrected Total	Class Management & Discipline Efficacy	1709.467	29				
	External Influences	4424.300	29				
	Teaching Efficacy	540.800	29				

2. Based on these tables, does it appear that the statistical assumptions of the equality of variances for the MANOVA have been met?

   a. What leads you to this conclusion?

   b. Based on your conclusion, which multivariate test is most appropriate?

3. Is there a significant multivariate result?

   a. What is it?

   b. How much variability is accounted for?

4. Which variable(s) distinguish between the schools?

Concepts and Interpretation.

1. What is/are the differences between univariate and multivariate statistics?

2. When would you conduct a multivariate analysis of variance?

3. What are the advantages of conducting a MANOVA?

4. What are the disadvantages of conducting an MANOVA?

5. Why should you do a pre-analysis screening before conducting a MANOVA?

6. How to calculate the amount of variance accounted for in a MANOVA.

7. Describe the steps one takes in conducting an MANOVA. What decisions are made at each step?

8. How does MANOVA differ from ANOVA?

9. From a computational point of view, how are ANOVA and MANOVA similar?

10.   Why would you want to have more than one dependent variable in a study?

11.   What is the Null Hypothesis in a MANOVA?

12.   What assumptions does one make about the data when conducting MANOVA?

13.   What are the steps in doing statistical significance testing in a MANOVA?

SPSS Assignment #4.

NAME: _____

1. Using SPSS, compute a MANOVA using gender as the independent variable and the V-1, V-2, V-3, and V-4 as dependent variables.

    a. What is Lambda?

    b. What is the multivariate F?

    c. Which vectors significantly distinguish between gender? Why do you say this?

    d. Which are practically significant? Why do you say this?