Answers to additional health exercises

Chapter 21 MANOVA

Conduct a one-way MANOVA to see if there are gender differences in each of the individual items that make up the Sleepiness and Associated Sensations Scale. The variables that you will need as dependent variables are *fatigued, lethargic, tired, sleepy, energy*.

Between-Subjects Factors

		Value Label	N
gender	0	female	144
	1	male	107

Descriptive Statistics

	gender	Mean	Std. Deviation	N
fatigued	female	5.30	2.444	144
	male	4.32	2.213	107
	Total	4.88	2.394	251
lethargic	female	5.00	2.486	144
	male	4.38	2.153	107
	Total	4.74	2.365	251
tired	female	5.66	2.333	144
	male	4.79	2.290	107
	Total	5.29	2.351	251
sleepy	female	5.89	2.210	144
	male	5.21	2.198	107
	Total	5.60	2.225	251
lack energy	female	5.99	2.387	144
	male	4.93	2.171	107
	Total	5.54	2.353	251

Box's Test of Equality of Covariance Matrices [a]

Box's M	33.480
F	2.183
df1	15
df2	208687.683
Sig.	.005

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

a. Design: Intercept+gender

Multivariate Tests [b]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.875	343.069[a]	5.000	245.000	.000	.875
	Wilks' Lambda	.125	343.069[a]	5.000	245.000	.000	.875
	Hotelling's Trace	7.001	343.069[a]	5.000	245.000	.000	.875
	Roy's Largest Root	7.001	343.069[a]	5.000	245.000	.000	.875
gender	Pillai's Trace	.068	3.566[a]	5.000	245.000	.004	.068
	Wilks' Lambda	.932	3.566[a]	5.000	245.000	.004	.068
	Hotelling's Trace	.073	3.566[a]	5.000	245.000	.004	.068
	Roy's Largest Root	.073	3.566[a]	5.000	245.000	.004	.068

a. Exact statistic

b. Design: Intercept+gender

Levene's Test of Equality of Error Variances [a]

	F	df1	df2	Sig.
fatigued	1.697	1	249	.194
lethargic	3.238	1	249	.073
tired	.157	1	249	.692
sleepy	.410	1	249	.522
lack energy	1.451	1	249	.229

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

a. Design: Intercept+gender

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	fatigued	59.058[a]	1	59.058	10.708	.001	.041
	lethargic	23.356[b]	1	23.356	4.229	.041	.017
	tired	46.964[c]	1	46.964	8.764	.003	.034
	sleepy	27.881[d]	1	27.881	5.736	.017	.023
	lack energy	69.996[e]	1	69.996	13.260	.000	.051
Intercept	fatigued	5676.684	1	5676.684	1029.226	.000	.805
	lethargic	5404.710	1	5404.710	978.538	.000	.797
	tired	6696.845	1	6696.845	1249.652	.000	.834
	sleepy	7568.662	1	7568.662	1557.160	.000	.862
	lack energy	7317.820	1	7317.820	1386.294	.000	.848
gender	fatigued	59.058	1	59.058	10.708	.001	.041
	lethargic	23.356	1	23.356	4.229	.041	.017
	tired	46.964	1	46.964	8.764	.003	.034
	sleepy	27.881	1	27.881	5.736	.017	.023
	lack energy	69.996	1	69.996	13.260	.000	.051
Error	fatigued	1373.356	249	5.515			
	lethargic	1375.290	249	5.523			
	tired	1334.382	249	5.359			
	sleepy	1210.278	249	4.861			
	lack energy	1314.395	249	5.279			
Total	fatigued	7411.000	251				
	lethargic	7031.000	251				
	tired	8397.000	251				
	sleepy	9114.000	251				
	lack energy	9082.000	251				
Corrected Total	fatigued	1432.414	250				
	lethargic	1398.645	250				
	tired	1381.347	250				
	sleepy	1238.159	250				
	lack energy	1384.390	250				

a. R Squared = .041 (Adjusted R Squared = .037)

b. R Squared = .017 (Adjusted R Squared = .013)

c. R Squared = .034 (Adjusted R Squared = .030)

d. R Squared = .023 (Adjusted R Squared = .019)

e. R Squared = .051 (Adjusted R Squared = .047)

The results presented in the table 'Box's Test of Equality of Covariance Matrices' indicate that we have not violated the assumption of homogeneity of variance-covariance matrices (we use p<.001 as the cut off because of the sensitivity of this test). The value in the table is p=.005 which is not less than the cut off of p=.001.

The Multivariate Tests table shows that there is a significant difference overall between the sexes on the set of dependent variables representing sensations of sleepiness (Wilks Lambda=.932; F(5, 245)=3.57, p=.004, partial eta squared=.068).

Given that we have a significant result overall we can now look at the results for each of the dependent variables separately. The Tests of Between Subjects Effect table indicate that the significance value for all dependent variables are below p=.05.

However if we apply the Bonferroni adjustment to control for Type 1 errors we need to divide the original p value of .05 by the number of dependent variables (5). This gives us a new p value of .01 to use as the cut off value. The only dependent variables with a significance value of less than .01 are fatigued, tired, and lacking energy.

Comparison of the mean scores for each of the significant dependent variables suggests that females have higher scores than males (eg., fatigued: females M=5.30, SD=2.44; males M=4.32, SD=2.2).