SPSS Chapter 23 Example 2 – Repeated Measures

Duneck, E. R. (1949), Learning with Secondary Reinforcement Under Two Different Strengths of the Relevant Drive, as reported in Lindquist (1953), examined how two groups of animals (n = 10 in each group), one hungry and the other satiated, learned a maze task over 20 days. The repeated day factor was collapsed into 4 times. T1 (Days 1 – 5), T2 (6 – 10), T3 (11 – 15) and T4 (16 – 20). After opening the file, the data appear in the SPSS Data Editor window just like the following (please note that for the variable entitled **hg**, 1 = hungry, 2 = satiated):

📺 Unt	📺 Untitled - SPSS Data Editor 📃 🖪 🔀								
<u>F</u> ile <u>E</u>	dit <u>V</u> iew <u>D</u> ata	<u>T</u> ransform <u>S</u> ta	tistics <u>G</u> raphs	<u>U</u> tilities <u>W</u> indow	<u>H</u> elp				
Ê	Fe s v s <u>t t v m t t e t s v</u>								
	hg	t1	ť2	ťĴ	t4	var	var		
1	1	3.00	3.00	3.00	3.00				
2	1	2.00	2.00	4.00	4.00				
3	1	4.00	2.00	5.00	5.00				
4	1	3.00	5.00	5.00	5.00				
5	1	2.00	5.00	5.00	4.00				
6	1	3.00	5.00	4.00	.00				
7	1	1.00	3.00	4.00	1.00				
8	1	4.00	5.00	3.00	3.00				
9	1	3.00	5.00	4.00	2.00				
10	1	.00	2.00	1.00	.00				
•									
		SP	SS Processor is re	ady					

Follow these steps to perform the Repeated Measures analysis:

1. Click **Analyze**, click **General Linear Model**, then click **Repeated Measures**. You will see the GLM-Repeated Measures Define Variable(s) dialog box as shown below.

GLM - Repeated Measures	s Define Fac	:tor(s) 🛛 🗙
Within-Subject Factor Name:	time	Define
Number of <u>L</u> evels:	4	<u>R</u> eset
Add		Cancel
<u>C</u> hange		Help
Re <u>m</u> ove	ŀ	/lea <u>s</u> ure >>

- 2. In the Within-Subject Factor Name text box type time.
- 3. Type 4 in the Number of Levels box. Click Add.
- 4. Click Define. You will see the GLM-Repeated Measures dialog box below.



- 5. Hold down the ctrl key and Click on **t1**, **t2**, **t3**, and **t4** and Click the arrow to move them to the **Within-Subjects Variables** box.
- 6. Click on **hg** to highlight it and Click on the arrow to move it into the box entitled, **Between-Subjects Factor(s)**.
- 7. Click Options. The following box will appear.

GLM - Repeated Measures: Options

- Estimated Marginal Means <u>Factor(s)</u> and Factor Interactions: ENDVERALL	Display <u>M</u> eans for:
hg time hg*time	
	Compare main effects
	Co <u>n</u> fidence interval adjustment: LSD (none)
– Display	
Descriptive statistics	Tr <u>a</u> nsformation matrix
Estimates of effect size	Homogeneity tests
C Observed power	Spread vs. level plots
Parameter es <u>t</u> imates	<u>R</u> esidual plots
□ <u>S</u> SCP matrices	Lack of fit test
Residual SS <u>C</u> P matrix	☐ <u>G</u> eneral estimable function
Significance le <u>v</u> el: .05 Con	ifidence intervals are 95%
	Continue Cancel Help

X

- 8. Highlight **OVERALL**, the two main effects and the interaction and Click the arrow to move them into the **Display Means For** box.
- 9. Click on the boxes beside Estimates of effect size, Descriptive statistics, Observed power, Homogeneity tests, etc.

10. Click Continue.

11. Click **Save**. The following window will appear:

GLM - Repeated Measures: Save						
Predicted Values <u>Unstandardized</u> <u>St</u> andard error	Residuals Unstandardized Standardized					
Diagnostics Coo <u>k</u> 's distance Le <u>v</u> erage values	☐ <u>S</u> tudentized ☐ <u>D</u> eleted					
Save to New File	Cancel Help					

- 12. To choose the various analyses, Click on the box beside each item.
- 13. Click Continue.
- 14. Click **OK**.

The SPSS output for this example of a Repeated Measures Design is the following:

General Linear Model

Within-Subjects Factors

Measure: MEASURE						
TIME	Dependent Variable					
1	T1					
2	T2					
3	Т3					
4	T4					

Between-Subjects Factors

		Value Label	N
HG	1	hungry	10
	2	satiated	10

Descriptive Statistics

			Std.	
	HG	Mean	Deviation	Ν
T1	hungry	2.5000	1.2693	10
	satiated	1.7000	1.1595	10
	Total	2.1000	1.2524	20
T2	hungry	3.7000	1.4181	10
	satiated	2.1000	1.4491	10
	Total	2.9000	1.6190	20
Т3	hungry	3.8000	1.2293	10
	satiated	2.7000	1.2517	10
	Total	3.2500	1.3328	20
T4	hungry	2.7000	1.8886	10
	satiated	2.2000	1.1353	10
	Total	2.4500	1.5381	20

Box's Test of Equality of Covariance Matrices

Box's M	7.323
F	.553
df1	10
df2	1549
Sig.	.853

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

a.

Design: Intercept+HG Within Subjects Design: TIME

Multivariate Tests

				Hypothesis			Eta	Noncent.	Observed
Effect		Value	F	df	Error df	Sig.	Squared	Parameter	Power
TIME	Pillai's Trace	.451	4.376 ^b	3.000	16.000	.020	.451	13.129	.773
	Wilks' Lambda	.549	4.376 ^b	3.000	16.000	.020	.451	13.129	.773
	Hotelling's Trace	.821	4.376 ^b	3.000	16.000	.020	.451	13.129	.773
	Roy's Largest Root	.821	4.376 ^b	3.000	16.000	.020	.451	13.129	.773
TIME * F	l Pillai's Trace	.094	.556 ^b	3.000	16.000	.652	.094	1.667	.139
	Wilks' Lambda	.906	.556 ^b	3.000	16.000	.652	.094	1.667	.139
	Hotelling's Trace	.104	.556 ^b	3.000	16.000	.652	.094	1.667	.139
	Roy's Largest Root	.104	.556 ^b	3.000	16.000	.652	.094	1.667	.139

a.Computed using alpha = .05

b.Exact statistic

C.

Design: Intercept+HG Within Subjects Design: TIME

Mauchly's Test of Sphericity

Measure: MEASURE_1

	Mauchlv's	Approx.			Epsilon ^a		
Within Subjects Effec	W	Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
TIME	.635	7.595	5	.181	.799	.981	.333

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is propor identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in t (by default) of the Tests of Within Subjects Effects table.

b.

Design: Intercept+HG Within Subjects Design: TIME

Tests of Within-Subjects Effects

Measure: MEASURE_1

		Type III							
		Sum of		Mean			Eta	Noncent.	Observed
Source		Squares	df	Square	F	Sig.	Squared	Parameter	Power
TIME	Sphericity Assumed	15.250	3	5.083	3.815	.015	.175	11.445	.789
	Greenhouse-Geisse	15.250	2.397	6.363	3.815	.023	.175	9.144	.716
	Huynh-Feldt	15.250	2.944	5.180	3.815	.016	.175	11.231	.783
	Lower-bound	15.250	1.000	15.250	3.815	.067	.175	3.815	.456
TIME * HG	Sphericity Assumed	3.300	3	1.100	.826	.486	.044	2.477	.217
	Greenhouse-Geisse	3.300	2.397	1.377	.826	.464	.044	1.979	.195
	Huynh-Feldt	3.300	2.944	1.121	.826	.484	.044	2.430	.215
	Lower-bound	3.300	1.000	3.300	.826	.376	.044	.826	.138
Error(TIME	Sphericity Assumed	71.950	54	1.332					
	Greenhouse-Geisse	71.950	43.139	1.668					
	Huynh-Feldt	71.950	52.988	1.358					
	Lower-bound	71.950	18.000	3.997					

a. Computed using alpha = .05

Levene's Test of Equality of Error Variances^a

	F	df1	df2	Sig.
T1	.020	1	18	.890
T2	.386	1	18	.542
Т3	.252	1	18	.622
T4	3.581	1	18	.075

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

a.

Design: Intercept+HG Within Subjects Design:

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

	Type III							
	Sum of		Mean			Eta	Noncent.	Observed
Source	Squares	df	Square	F	Sig.	Squared	Parameter	Power ^a
Intercept	572.450	1	572.450	163.427	.000	.901	163.427	1.000
HG	20.000	1	20.000	5.710	.028	.241	5.710	.618
Error	63.050	18	3.503					

a. Computed using alpha = .05

Observed * Predicted * Std. Residual Plots

Dependent Variable: T1

Obse	erve	əd				•	0	0	0	0
			•	Predicted						
				•						
				•	٥					
				•		Stc	I. R	esid	ual	
				•						
					•					

Dependent Variable: T2



Dependent Variable: T3

Obs	erve	əd					•	0	•	•	
•		٥	٥	•				۰	٥	٥	
				0	Predicted						
						Std.	R	esic	dua		

Dependent Variable: T4

Observed					
	Predicted				
		Std. Residual			