Repeated Measures Oneway ANOVA

For this problem a social psychological researcher working for an advertising firm was interested in finding out if frequency of exposure to a stimulus would influence one's liking for the stimulus. The researcher was of the opinion that a person's liking for a stimulus would increase the more frequently the person was exposed to the stimulus. To find out if this was true the researcher exposed a group of people to a test commercial and then asked them to indicate how much they liked the test commercial after they had seen it for the first time, then again after they had seen it five times, and then again after they had seen it ten times. The people indicated their liking for the test commercial on a 15 point liking scale that looked like that below:

low liking: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15: high liking

The researcher recorded each person's responses in a table which looked like that below:

Levels of Independent Variable (Frequency of Exposure)

Subject	**Once**	**Five Times**	**Ten Times**
John	2	4	9
Mary	3	6	9
Frank	2	5	8
Sue	4	8	12
Ron	1	6	8
Jane	4	5	7

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Once** (for One Time).
6. Click on the white cell in **Row 1** under the word **Label** and type in the words **One Time**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **Five** (for Five Times).
8. Click on the white cell in **Row 2** under the word **Label** and type in the words **Five Times**. (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in the word **Ten** (for Ten Times).
10. Click on the white cell in **Row 3** under the word **Label** and type in the words **Ten Times**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

11. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Once** (for one time) , Column 2 named **Five** (for five times), and Column 3 named **Ten** (for ten times.)
12. Enter the data for the six cases (John through Jane) as follows: Click on the top left cell under the first column **Once** and enter:

2 tab	4 tab	9 enter	Then mouse to the second row to enter the data for the second case.
3 tab	6 tab	9 enter	Then mouse to the third row to enter the data for the third case etc. for the remaining cases.
2 tab	5 tab	8 enter	
4 tab	8 tab	12 enter	
1 tab	6 tab	8 enter	
4 tab	5 tab	7 enter	

The data may also be entered down one column at a time, entering all the numbers for the "once" condition, then moving on to column 2 and entering the numbers for the "five times" condition and then moving on to column 3 and entering the numbers for the "ten times" condition.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **General Linear Model** then
   b. Click on **GLM-Repeated Measures**
2. Highlight the word **factor1** in the **within-subjects factor** name box then
   a. Type in **Times** (This is a short name for the independent variable, number of times commercial was seen, and is limited to eight characters), then
   b. Click in white square next to **Number of Levels** and enter the number **3** (since there are 3 levels of the independent variable) then
   c. Click on the **Add** button
3. Click on the **Define** button then
   a. Highlight the word **Once** by clicking on it then
   b. Click on the **arrow >** to move this into the **within subjects variable** box at "level 1" of the within subjects variable box then
   c. Highlight the word **Five** by clicking on it then
   d. Click on the **arrow >** to move this into the **within subjects variable** box at "level 2" of the within subjects variable box then
   e. Highlight the word **Ten** by clicking on it then
   f. Click on the **arrow >** to move this into the **within subjects variable** box at "level 3" of the within subjects variable box
4. Click on **Options** button then
   a. Click in white box next to **Descriptive Statistics** (A check mark should appear) then
   b. Click **Continue** button
5. Click **OK**
6. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Descriptive Statistics

	Mean	Std. Deviation	N
ONCE	2.6667	1.21106	6
Five Times	5.6667	1.36626	6
Ten Times	8.8333	1.72240	6

Multivariate Tests [b]

Effect		Value	F	Hypothesis df	Error df	Sig.
TIMES	Pillai's Trace	.942	32.218[a]	2.000	4.000	.003
	Wilks' Lambda	.058	32.218[a]	2.000	4.000	.003
	Hotelling's Trace	16.109	32.218[a]	2.000	4.000	.003
	Roy's Largest Root	16.109	32.218[a]	2.000	4.000	.003

a. Exact statistic

b.
Design: Intercept
Within Subjects Design: TIMES

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[a]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
TIMES	.806	.864	2	.648	.837	1.000	.500

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

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

b.
Design: Intercept
Within Subjects Design: TIMES

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TIMES	Sphericity Assumed	114.111	2	57.056	54.053	.000
	Greenhouse-Geisser	114.111	1.675	68.138	54.053	.000
	Huynh-Feldt	114.111	2.000	57.056	54.053	.000
	Lower-bound	114.111	1.000	114.111	54.053	.001
Error(TIMES)	Sphericity Assumed	10.556	10	1.056		
	Greenhouse-Geisser	10.556	8.374	1.261		
	Huynh-Feldt	10.556	10.000	1.056		
	Lower-bound	10.556	5.000	2.111		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	TIMES	Type III Sum of Squares	df	Mean Square	F	Sig.
TIMES	Linear	114.083	1	114.083	76.910	.000
	Quadratic	2.778E-02	1	2.778E-02	.044	.842
Error(TIMES)	Linear	7.417	5	1.483		
	Quadratic	3.139	5	.628		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	589.389	1	589.389	140.703	.000
Error	20.944	5	4.189		

7. For the problem above the null and alternative hypotheses are spelled out below:

H_{null}: a) The mean liking evaluations at all three times will be equal

H_{alt}: b) The mean liking evaluations at all three times will not be equal

8. **Interpretation and APA writing template for Result Above**

A one way repeated measures analysis of variance was conducted to determine whether frequency of exposure to a stimulus (once, five times or ten times) influenced a person's liking evaluation of that stimulus. Results of the analysis indicated that the null hypothesis of equality among means should be rejected, and that the frequency of exposure to a stimulus significantly influenced the liking evaluation of that stimulus, $\underline{F}$ (2,10) = 54.05, $\underline{p} < .05$. The means and standard deviations of liking evaluations for the stimulus after having seen it once, five times, or ten times were respectively ($\underline{M}$ = 2.667, $\underline{SD}$ = 1.211), ($\underline{M}$ = 5.667, SD = 1.366), and ($\underline{M}$ = 8.833, $\underline{SD}$ = 1.722). A post ANOVA Tukey test indicated that all three means differed significantly from one another, $\underline{p} < .05$. More frequent exposure to the stimulus was associated with greater liking for that stimulus.