

JMP Analysis of a Split Plot/Repeated Measures Design

The data are from an experiment run to evaluate the effect of solitary confinement on brain activity of prisoners, i.e. frequency of brain waves. There are two factors of interest: the whole plot factor (Solitary Confinement – Yes/No) and the subplot factor (Day – 1, 4, 7). The prisoners are repeatedly measured on days 1, 4, and 7. There are four columns in the JMP Data Table: Solitary, Prisoner, Day and Frequency. Make sure that Solitary, Prisoner and Day are Character – Nominal variables. Frequency is a Numeric – Continuous variable.

Solitary	Prisoner	Day	Frequency
Yes	1	1	14
Yes	2	1	24
Yes	3	1	21
Yes	4	1	20
Yes	5	1	15
Yes	6	1	17
Yes	7	1	16
Yes	8	1	10
Yes	9	1	6
Yes	10	1	32
No	11	1	20
No	12	1	16
No	13	1	15
No	14	1	20
No	15	1	14
No	16	1	13
No	17	1	4
No	18	1	22
No	19	1	21
No	20	1	13
Yes	1	4	7
Yes	2	4	16
Yes	3	4	10
⋮	⋮	⋮	⋮
No	18	7	21
No	19	7	22
No	20	7	14

You will need to use the Fit Model platform

- The response variable, Y, is Frequency
- In the Construct Model Effects' box, Add Solitary. Add Prisoner.
- Highlight Prisoner in the Construct Model Effects' box and highlight Solitary in the Select Columns box. Click on Nest. This should change Prisoner to Prisoner nested within Solitary: Prisoner[Solitary].
- Add Day.
- Add a Solitary*Day interaction by highlighting both Solitary and Day in the Select Columns box and clicking on Cross.
- Be sure to ask for a Minimal Report and click on OK.

The output from this analysis appears below. Note that the F-Ratio for testing for a difference between solitary and no solitary confinement uses the **incorrect** error term.

Response: Frequency (Hz)

Summary of Fit

RSquare	0.958831
RSquare Adj	0.932529
Root Mean Square Error	1.683251
Mean of Response	13.8
Observations (or Sum Wgts)	60

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	23	2375.6000	103.287	36.4542
Error	36	102.0000	2.833	Prob > F
C. Total	59	2477.6000		<.0001

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Solitary	1	1	248.0667	87.5529	<.0001
Prisoner[Solitary]	18	18	1610.2000	31.5725	<.0001
Day	2	2	256.9000	45.3353	<.0001
Solitary*Day	2	2	260.4333	45.9588	<.0001

Go back to the Construct Model Effects' box and highlight Prisoner[Solitary]. Click on the red arrow to the right of Attributes and select Random Effect. Change the Method from REML (Recommended) to EMS (Traditional). This should produce the output below.

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RSquare Adj	0.932529
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Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	23	2375.6000	103.287	36.4542
Error	36	102.0000	2.833	Prob > F
C. Total	59	2477.6000		<.0001

Tests wrt Random Effects

Source	SS	MS Num	DF Num	F Ratio	Prob > F
Solitary	248.067	248.067	1	2.7731	0.1132
Prisoner[Solitary]&Random	1610.2	89.4556	18	31.5725	<.0001
Day	256.9	128.45	2	45.3353	<.0001
Solitary*Day	260.433	130.217	2	45.9588	<.0001