

Repeated Measures Analysis (Mixed Model)

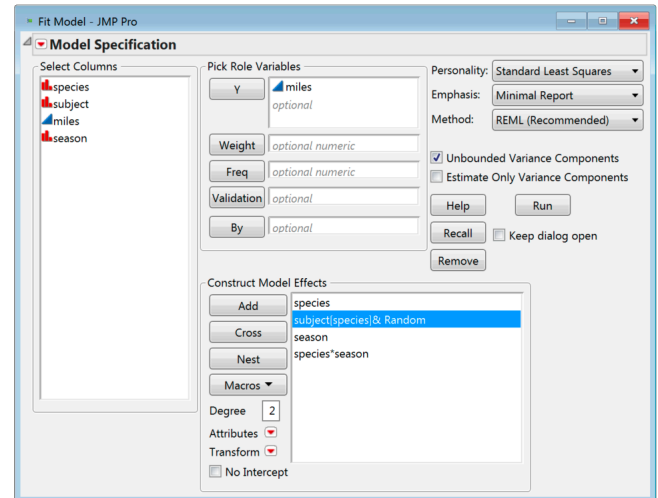
This page provides information on the analysis of repeated measures data using mixed models. The term of *repeated measures* refers to data with multiple measurements taken on the same subjects, often taken over a period of time.

The example below involves six animal subjects randomly selected from two species. The miles traveled by each animal were measured over time. Since this data is in a tall format (stacked), a mixed model analysis is used.

Analysis of Repeated Measures: Mixed Model

1. From an open JMP® data table, select **Analyze > Fit Model**.
2. Add the response: From **Select Columns**, select a continuous variable (continuous variables have blue triangles), and click **Y**.
3. Add model effects: Select variables and click **Add** (under **Construct Model Effects**). To specify an interaction term, select multiple columns, then click **Cross**.
4. Specify the nesting structure: Here, subject is nested within species. Select subject from **Construct Model Effects**, select species from **Select Columns**, and click **Nest**. (If the subject ID is uniquely valued, skip this step.)
5. Specify random effect(s): Select a model effect, then select **Random** from the red triangle next to **Attributes**. Here, “subject[species]” is specified as a random effect.
6. Accept the defaults (the **REML Method** with **Unbounded Variance Components** selected), and click **Run**.

Example: Animals.jmp (Help > Sample Data)

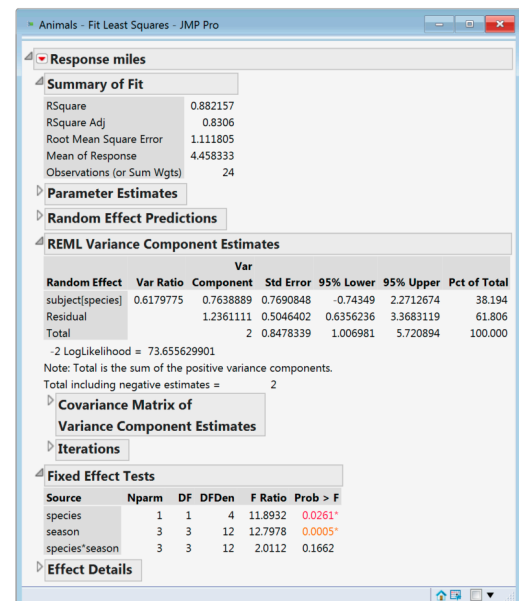


By default, JMP will display the **Summary of Fit** table, **REML Variance Components Estimates**, **Fixed Effect Tests** and more.

Additional options are available under the **top red triangle**.

Interpretation:

1. Variance Components Estimates: Show the estimated variances for random effects and the residual error. In this example, the estimated variation between animals is 0.76, or 38% of the total variation.
2. Fixed Effect Tests: Show the F-test results for the fixed effects using the appropriate variance component estimate as an error term in the denominator. Here, species and season are both significant at alpha = 0.05, while the interaction is not.



Summary of Fit							
RSquare	0.882157						
RSquare Adj	0.8306						
Root Mean Square Error	1.111805						
Mean of Response	4.458333						
Observations (or Sum Wgts)	24						

REML Variance Component Estimates							
Random Effect	Var Ratio	Component	Std Error	95% Lower	95% Upper	Pct of Total	
subject[species]	0.6179775	0.7638889	0.7690848	-0.74349	2.2712674	38.194	
Residual	1.2361111	0.5046402	0.6356236	3.3683119	61.806		
Total		2	0.8478339	1.006981	5.720894	100.000	

-2 LogLikelihood = 73.655629901
Note: Total is the sum of the positive variance components.
Total including negative estimates = 2

Fixed Effect Tests							
Source	Nparm	DF	DFDen	F Ratio	Prob > F		
species	1	1	4	11.8932	0.0261*		
season	3	3	12	12.7978	0.0005*		
species*season	3	3	12	2.0112	0.1662		

Notes: For more information on mixed model analysis, refer to the **Mixed Model Analysis** one-page guide at jmp.com/learn. **MANOVA** is used for data in a “wide” (split) format. For additional details on repeated measures analysis, search for “REML” or “MANOVA” in the JMP Help or in the book *Fitting Linear Models* (under **Help > Books**).