



Rating of Advertisement

The purpose of this research paper is to provide a comprehensive, step-by-step guide for conducting a **Mixed Analysis of Variance (Mixed ANOVA)** using the Isalos Analytics Platform. Mixed ANOVA combines both **between-subjects** and **within-subjects** factors within a single statistical model, allowing analysts to simultaneously examine group differences, repeated-measures effects, and their interaction. This methodology is particularly valuable in behavioural, psychological, and marketing research, where participants belong to different groups while providing repeated responses under multiple experimental conditions.

Mixed ANOVA combines the principles of between-subjects ANOVA and repeated-measures ANOVA. By incorporating both independent groups and repeated observations within the same analysis, the procedure evaluates overall group differences, changes across repeated conditions, and whether repeated-measures effects differ between groups.

Isalos version used: 2.1.5

The dataset used in this analysis is the **Advertisement Rating Dataset**, available on JMP.

This dataset simulates a marketing experiment investigating consumer evaluations of advertisements. It includes participant-level information such as expertise level, advertisement endorser type, and advertisement ratings. The dataset is designed to examine whether advertisement evaluations differ according to participant expertise and the type of endorser featured in the advertisement.

For the purposes of this Mixed ANOVA analysis, variables are classified as follows:

- **Dependent Variable (Response):** Rating— this is a continuous outcome measure representing the participant's evaluation of the advertisement.
- **Between-Subjects Factor:** Expertise (Expert, Novice) — this categorical variable represents the participant's level of expertise. Each participant belongs to only one expertise group.
- **Within-Subjects Factor:** Endorser (Celebrity, Unknown) — this categorical variable represents the type of advertisement endorser. Each participant provides ratings for both endorser conditions, making this the repeated-measures factor.

Step 1: Import Data from file

Firstly, launch the Isalos Analytics Platform (version 2.1.2). Then, in the left spreadsheet panel, create a new tab by clicking **File** and choose **Open** to load the ads dataset (or simply copy-paste the data from your spreadsheet).

Subjecty Number	Expertise (B)	Endorser (W)	Rating
1	Expert	Celebrity	44
1	Expert	Unknown	48.5
2	Novice	Celebrity	63.5
2	Novice	Unknown	57
3	Expert	Celebrity	53
3	Expert	Unknown	49
4	Novice	Celebrity	62
4	Novice	Unknown	51
5	Expert	Celebrity	60.5
5	Expert	Unknown	67
6	Novice	Celebrity	42.5
6	Novice	Unknown	36.5
7	Expert	Celebrity	51.5
7	Expert	Unknown	54
8	Novice	Celebrity	44
8	Novice	Unknown	43
9	Expert	Celebrity	40.5

Step 2: Access the Mixed ANOVA function

Navigate to the Mixed ANOVA analysis module through the main menu by choosing the following path:

Statistics → Analysis of (Co)Variance → Mixed ANOVA

Then, you will see the Mixed ANOVA configuration window:

Mixed ANOVA

Confidence Level (%) Double (0,100), Default: -

Sum of Squares for Tests Adjusted (Type III)

Coding for Between Factors (-1, 0, +1)

Subject Column

Within Column

Dependent Variable

Excluded Columns

- Col2 -- Subjcy Number
- Col3 -- Expertise (B)
- Col4 -- Endorser (W)
- Col5 -- Rating

Between-Subjects Factors

Specify Reference Levels

Covariates

Formula Type: ☒ Custom ☐ Main Effects ☐ Full Factorial

Specify Custom Model Formula

Formula:

Execute Cancel

Step 3: Configure Mixed ANOVA parameters

Steps in Isalos Analytics Platform:

In the Mixed ANOVA configuration window, set the following parameters:

- * Confidence Level (%): 95
- * **Between-Subjects factors:** Col3 -- Expertise

- * **Subject Column:** Col2 – Subject Number
- * **Within Column:** Col4 – Endorser

Then, for **Formula Type**, choose **Full Factorial**. The formula preview will display the multivariate model as shown below:

Mixed ANOVA

Confidence Level (%) 95

Sum of Squares for Tests Adjusted (Type III)

Coding for Between Factors (-1, 0, +1)

Subject Column Col2 -- Subject Number

Within Column Col4 -- Endorser (W)

Dependent Variable Col5 -- Rating

Excluded Columns

Between-Subjects Factors
Col3 -- Expertise (B)

Specify Reference Levels

Covariates

Formula Type: ☐ Custom ☐ Main Effects ☒ Full Factorial

Specify Custom Model Formula

Formula: Expertise (B)

Execute Cancel

After configuring all parameters:

- * Review all selections to ensure accuracy.
- * Click the **Execute** button to run the Mixed ANOVA analysis.
- * Wait for the computation to complete (processing time depends on dataset size and the number of dependent variables).

Step 4: Results

The analysis results will be displayed in the right spreadsheet panel. The output typically includes the following components:

WITHIN-SUBJECTS EFFECTS							
Source	Endorser (W)	DF	Adj SS	Adj MS	F-Value	P-Value	Significant
Endorser (W)	Linear	1	86.7000000	86.7000000	12.0916141	0.0009668	Yes
Endorser (W) * Expertise (B)	Linear	1	165.6750000	165.6750000	23.1058611	0.0000113	Yes
Error(Endorser (W))	Linear	58	415.8750000	7.1702586			
BETWEEN-SUBJECTS EFFECTS							
Source	DF	Adj SS	Adj MS	F-Value	P-Value	Significant	
Intercept	1	312528.133333	312528.133333	2434.0170064	0.0	Yes	
Expertise (B)	1	37.4083333	37.4083333	0.2913418	0.5914283	No	
Error	58	7447.2083333	128.4001437				

Step 5 : Residual Analysis & Assumption's checks

Choose

Statistics → Analysis of (Co)Variance → Mixed ANOVA

and choose

Residual Analysis & Assumption's Checks.

You get the following window:


Residual Analysis & Assumption's Checks
?
×

Normality of Residuals

Statistical Tests

☐ Shapiro-Wilk Test
 ☐ Anderson-Darling Test
 ☐ Kolmogorov-Smirnov Test

Plots

☐ Normal Q-Q Plots
 ☐ Histogram of Residuals
 ☐ Density Plot of Residuals

Residual Diagnostics

Plots

☐ Residuals vs Observation Order

Homogeneity of Variance (Homoscedasticity)

Statistical Tests

☐ Mauchly's Test

Plots

☐ Residuals vs Fitted Values
 ☐ Residuals vs Dependent Variable
 ☐ Boxplots by Group
 ☐ Violin Plot by Group

Model Adequacy

Plots

☐ Residuals vs Fitted values
 ☐ Residuals vs Each Factors
 ☐ Residuals vs Covariates

Save

Cancel

then choose the tests you want. For example, choose the following:


Residual Analysis & Assumption's Checks
?
×

Normality of Residuals

Statistical Tests

☐ Shapiro-Wilk Test
 ☐ Anderson-Darling Test
 ☒ Kolmogorov-Smirnov Test

Plots

☒ Normal Q-Q Plots
 ☒ Histogram of Residuals
 ☒ Density Plot of Residuals

Residual Diagnostics

Plots

☒ Residuals vs Observation Order

Homogeneity of Variance (Homoscedasticity)

Statistical Tests

☐ Mauchly's Test

Plots

☒ Residuals vs Fitted Values
 ☒ Residuals vs Dependent Variable
 ☒ Boxplots by Group
 ☒ Violin Plot by Group

Model Adequacy

Plots

☒ Residuals vs Fitted values
 ☒ Residuals vs Each Factors
 ☒ Residuals vs Covariates

Save

Cancel

After that, click execute and you get the results (some of them below):

6



