

MANOVA Report
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Folder:
D:\DATA ANALYSIS\E ANOVA Family\MANOVA

Input file:
D:\DATA ANALYSIS\E ANOVA Family\MANOVA\dataset.csv

Dependent variables:
G1, G2, G3

Grouping factor:
studytime

Hypotheses:
H0: The multivariate mean vector of G1, G2, G3 is equal across studytime groups.
H1: At least one studytime group has a different multivariate mean vector.

Primary MANOVA decision using Pillai's trace:
Pillai trace = 0.084645
F = 6.242352
p-value = 0.00000001
Decision = Reject equal multivariate means

Complete multivariate test table:

multivariate_test	Value	Num DF	Den DF	F Value	Pr > F	decision_alpha_0_05
Wilks' lambda	0.916014	9	1565.043647	6.382270	6.196767e-09	Reject equal multivariate means
Pillai's trace	0.084645	9	1935.000000	6.242352	9.861212e-09	Reject equal multivariate means
Hotelling-Lawley trace	0.090967	9	1007.249889	6.491785	5.074502e-09	Reject equal multivariate means
Roy's greatest root	0.082457	3	645.000000	17.728191	4.556784e-11	Reject equal multivariate means

Follow-up univariate ANOVA table:

dependent_variable	df_between	df_error	ss_between	ss_error	f_statistic	p_value	eta_squared	decision_alpha_0_05
G1	3.0	645.0	342.986237	4540.653208	16.240404	3.467159e-10	0.070232	Reject equal means
G2	3.0	645.0	346.517680	5154.542413	14.453524	4.016781e-09	0.062991	Reject equal means
G3	3.0	645.0	465.077825	6298.188739	15.876268	5.705728e-10	0.068765	Reject equal means

Covariance assumption check:

test_name	box_m	chi_square_approx	df	p_value	decision_alpha_0_05	note
Box M covariance equality test	91.096413	89.573106	18.0	1.722500e-11	Covariance matrices differ	Approximation; interpret with sample size and group balance.

Plain-language interpretation:

If Pillai's trace p-value is below 0.05, the set of dependent variables differs by group.
After a significant MANOVA, inspect the follow-up ANOVA table and charts to see which outcomes explain the difference.