

2xkxQ Example: “Factorial ANCOVA” Type Analysis

The focus of the study was gender differences in depression, whether gender differences are moderated by marital status, and whether this interaction was moderated by stress → 2x3xQ model

UNIANOVA depression BY marital gender WITH stress

← dvs BY ivs WITH covariate(s)

/METHOD = SSTYPE(3)

← gets F-tests correcting each term for others

/PRINT=DESCRIPTIVE

/DESIGN=gender marital stress
gender*marital stress*gender stress*marital
stress*gender*marital.

← specifies the factorial model – main effects
← 2-ways
← 3-way

Tests of Between-Subjects Effects

Dependent Variable: depression

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4108.543 ^a	7	586.935	17.168	.000
Intercept	1807.389	1	1807.389	52.866	.000
gender	60.084	1	60.084	1.757	.186
marital	114.273	1	114.273	3.342	.068
marital * gender	24.140	1	24.140	.706	.401
stress	2521.175	1	2521.175	73.744	.000
gender * stress	.473	1	.473	.014	.906
marital * stress	207.654	1	207.654	6.074	.014
marital * gender * stress	469.408	1	469.408	13.730	.000
Error	12136.746	355	34.188		
Total	32432.000	363			
Corrected Total	16245.289	362			

a. R Squared = .253 (Adjusted R Squared = .238)

In the factorial ANOVA there was a significant Gender effect and a significant Gender * Marital Status interaction, neither of which are significant in this factorial ANCOVA with stress as the covariate.

However, both variables and Stress are involved in a 3-way interaction.

The significant Stress effect, along with the changes noted above, suggest the utility of this ANCOVA.

The significant Marital*Stress & significant 3-way both suggest the homogeneity of regression slope assumption isn't tenable.

Describing the Results

The intent of the study was to examine Gender differences in depression, how those differences were moderated by Marital Status, and if that interaction was different for different values of Stress.

So, the analysis that gives the most direct examination of the research question, as it is phrased, would be to examine the Gender * Marital Status interaction effects at different levels of Stress. Based on an examination of the distribution of Stress Scores and an understanding of the clinical relevance of Stress score values, we chose to examine these effects at Stress values of 2 (“low”), the mean (8.62 “moderate”) and 12 (“substantial”).

UNIANOVA depression BY marital gender WITH stress

← dvs BY ivs WITH covariate(s)

/METHOD = SSTYPE(3)

← gets F-tests correcting each term for others

/EMMEANS=TABLES(marital*gender) WITH (stress=2) COMPARE (gender)
/EMMEANS=TABLES(marital*gender) WITH (stress=mean) COMPARE (gender)
/EMMEANS=TABLES(marital*gender) WITH (stress=12) COMPARE (gender)

← get follow-ups analyses to examine marital * gender interaction for different levels of stress

/PRINT=DESCRIPTIVE PARAMETER

← gets cell means & uncorrected/raw marginal means

/DESIGN=gender marital stress
gender*marital stress*gender stress*marital
stress*gender*marital.

← specifies the factorial model – main effects
← 2-ways
← 3-way

Gender *Marital Status Interaction for Stress = 2, Mean(8.62) & 12

For brevity, I'm going to leave out the Univariate Tests – because these are all df=1 comparisons, they are redundant with the Pairwise Comparisons

Stress = 2

Estimates

Dependent Variable: depression

marital	gender	Mean	Std. Error
single	male	4.344 ^a	.751
	female	5.487 ^a	.776
married	male	2.870 ^a	1.014
	female	4.318 ^a	.810

a. Covariates appearing in the model are evaluated at the following values: stress = 2.

Pairwise Comparisons

Dependent Variable: depression

marital	(I) gender	(J) gender	Mean Difference (I-J)	Std. Error	Sig. ^a
single	male	female	-1.143	1.079	.290
	female	male	1.143	1.079	.290
married	male	female	-1.448	1.298	.265
	female	male	1.448	1.298	.265

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Stress = mean (8.62)

Estimates

Dependent Variable: depression

marital	gender	Mean	Std. Error
single	male	5.017 ^a	.530
	female	8.399 ^a	.543
married	male	7.157 ^a	.871
	female	6.503 ^a	.701

a. Covariates appearing in the model are evaluated at the following values: stress = 8.62.

Pairwise Comparisons

Dependent Variable: depression

marital	(I) gender	(J) gender	Mean Difference (I-J)	Std. Error	Sig. ^b
single	male	female	-3.382 [*]	.759	.000
	female	male	3.382 [*]	.759	.000
married	male	female	.653	1.118	.559
	female	male	-.653	1.118	.559

Based on estimated marginal means

*. The mean difference is significant at the .050 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Stress = 12

Estimates

Dependent Variable: depression

marital	gender	Mean	Std. Error
single	male	5.361 ^a	.579
	female	9.885 ^a	.550
married	male	9.343 ^a	1.014
	female	7.618 ^a	.834

a. Covariates appearing in the model are evaluated at the following values: stress = 12.

Pairwise Comparisons

Dependent Variable: depression

marital	(I) gender	(J) gender	Mean Difference (I-J)	Std. Error	Sig. ^b
single	male	female	-4.524 [*]	.799	.000
	female	male	4.524 [*]	.799	.000
married	male	female	1.725	1.313	.190
	female	male	-1.725	1.313	.190

Based on estimated marginal means

*. The mean difference is significant at the .050 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Stress = 2

Male Female

Single =

Married =

Stress = mean (8.62)

Male Female

Single <

Married =

Stress = 12

Male Female

Single <

Married =

This reveals the 3-way interaction pattern. There were no Gender effects for either single or married people reporting low amounts of stress, however, for those reporting moderate and substantial amounts of stress, single females reported more depressive symptoms than single males, whereas married females and married males reported equivalent levels of depressive symptoms.