

## 2xQxQ GLM Example

### Starting with the QxQ Buffering Hypothesis:

Does Social support moderates the Stress → Depression relationship?

The purpose of the study was to explore the “buffering hypothesis.” The buffering hypothesis states that social support “buffers” or moderates the effect of stress upon depression. Specifically, depression is expected to be greater for those with more stress. However, this positive linear relationship is expected to be less-positive for those with more social support. For this study, social support of friends (FRSS) was chosen as the buffering/moderator variable to be explored.

We need to construct mean-centered versions of each quantitative variable, then include them and their interaction, in a GLM.

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
stress	405	0	39	8.70	7.448
friend social support	405	1.00	7.00	5.5705	1.30679
Valid N (listwise)	405				

compute stress\_mcen = stress – 8.70.

compute frss\_mcen = frss - 5.5705.

exe.

UNIANOVA dep WITH stress\_mcen frss\_mcen

/METHOD=SSTYPE(3)

/PRINT=PARAMETER

/DESIGN= stress\_mcen frss\_mcen

frss\_mcen\*stress\_mcen.

**Tests of Between-Subjects Effects**

Dependent Variable: depression (BDI)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5453.342 <sup>a</sup>	3	1817.781	61.528	.000
Intercept	21817.482	1	21817.482	738.479	.000
stress_mcen	3112.295	1	3112.295	105.345	.000
frss_mcen	1112.726	1	1112.726	37.664	.000
stress_mcen * frss_mcen	164.567	1	164.567	5.570	.019
Error	11847.063	401	29.544		
Total	39805.000	405			
Corrected Total	17300.405	404			

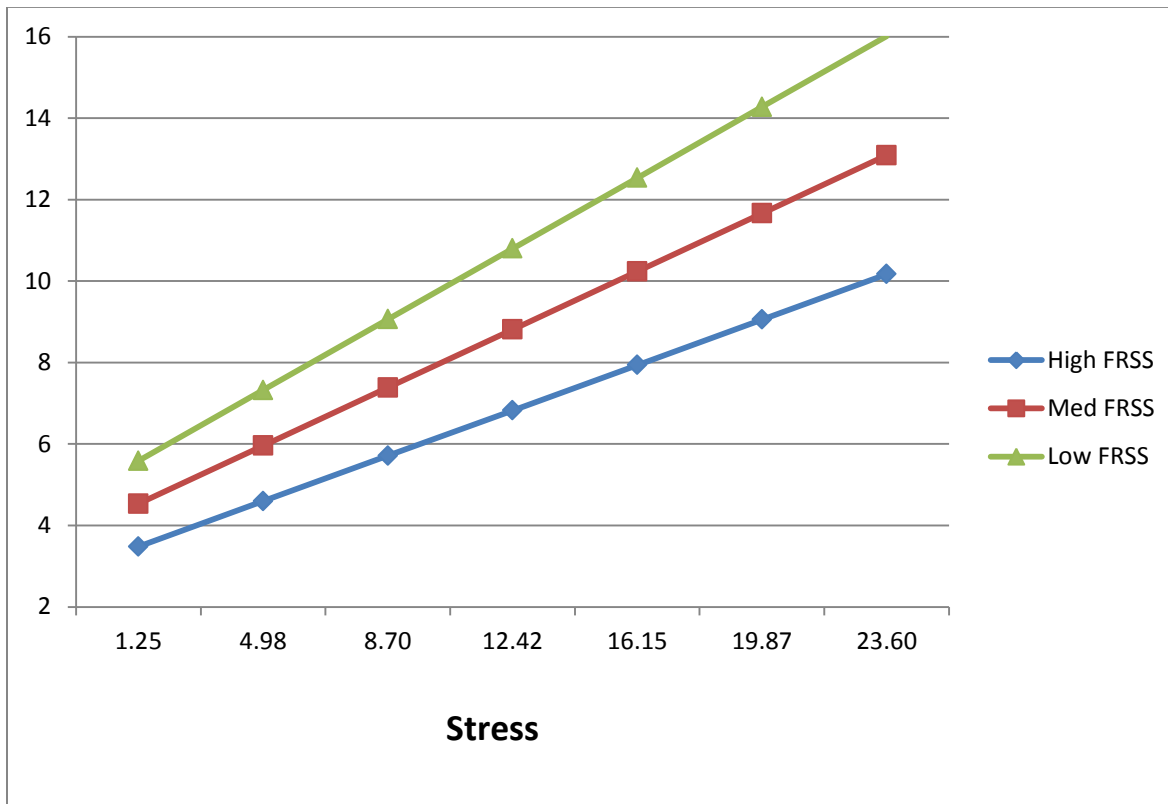
a. R Squared = .315 (Adjusted R Squared = .310)

**Parameter Estimates**

Dependent Variable: stress

Parameter	B	Std. Error	t	Sig.
Intercept	8.700	1.002E-013	3.556E+16	.000
stress_mcen	1.000	1.000E-013	2.973E+16	.000
frss_mcen	-1.032E-013	1.002E-013	-17.238	.000
stress_mcen * frss_mcen	-1.004E-013	1.000E-013	-16.125	.000

Here's the plot of the resulting QxQ model



These results show good support for the Buffering Hypothesis!

As expected, there is an overall positive relationship between Stress and Depression. We know that this slope is significantly positive for those with a mean level of FRSS (FRSS = 5.57,  $b = .383$ ,  $p < .001$ ).

As expected, there is also an overall negative relationship between Friend Social Support and Depression. We know this slope is significantly negative for those with a mean level of Stress (Stress = 8.70,  $b = -1.282$ ,  $p < .001$ ).

As expected, there is a significant negative interaction ( $b = .064$ ,  $p = .019$ ). The negative interaction weight tells us that the linear relationship between Stress and Depression is less positive for those with higher FRSS values (or, that the linear relationship between FRSS and Depression is less negative for those with lower FRSS values).

Looking at the graph, we can see that there is less of a "stress effect" for those with higher FRSS. That is, the slope of the Depression-Stress regression line is flatter for those with more social support from their friends.

Is this "buffering effect" further moderated by additional variables? The students who participated in this study were a combination of "traditional" and "nontraditional" students, with respect to age. Thus, membership in this important 2-category "grouping variable" is an interesting "moderator" to explore.

**2xQxQ → Does “Traditional/Nontraditional Student” Moderate the Buffering Effect of Social Support on the Stress → Depression Relationship?**

We need to construct mean-centered versions of each quantitative variable, then include them and their interaction, in a GLM.

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
stress	405	0	39	8.70	7.448
friend social support	405	1.00	7.00	5.5705	1.30679
Valid N (listwise)	405				

compute stress\_mcen = stress – 8.70.

compute frss\_mcen = frss - 5.5705.

exe.

```
UNIANOVA dep BY group WITH stress_mcen frss_mcen
/METHOD=SSTYPE(3)
/PRINT=PARAMETER
/DESIGN= group stress_mcen frss_mcen
        frss_mcen*group
        frss_mcen*stress_mcen
        group*stress_mcen
        frss_mcen*group*stress_mcen.
```

**Tests of Between-Subjects Effects**

Dependent Variable: depression (BDI)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5761.353 <sup>a</sup>	7	823.050	28.317	.000
Intercept	18966.961	1	18966.961	652.556	.000
group	163.745	1	163.745	5.634	.018
stress_mcen	2579.017	1	2579.017	88.731	.000
frss_mcen	1308.003	1	1308.003	45.002	.000
group * frss_mcen	1.364	1	1.364	.047	.829
stress_mcen * frss_mcen	297.578	1	297.578	10.238	.001
group * stress_mcen	31.739	1	31.739	1.092	.297
group * stress_mcen * frss_mcen	67.455	1	67.455	10.595	.000
Error	11539.052	397	29.066		
Total	39805.000	405			
Corrected Total	17300.405	404			

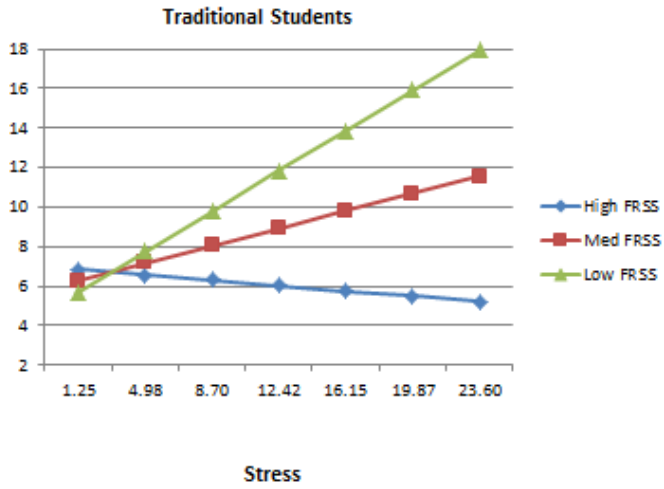
a. R Squared = .333 (Adjusted R Squared = .321)

**Parameter Estimates**

Dependent Variable: depression (BDI)

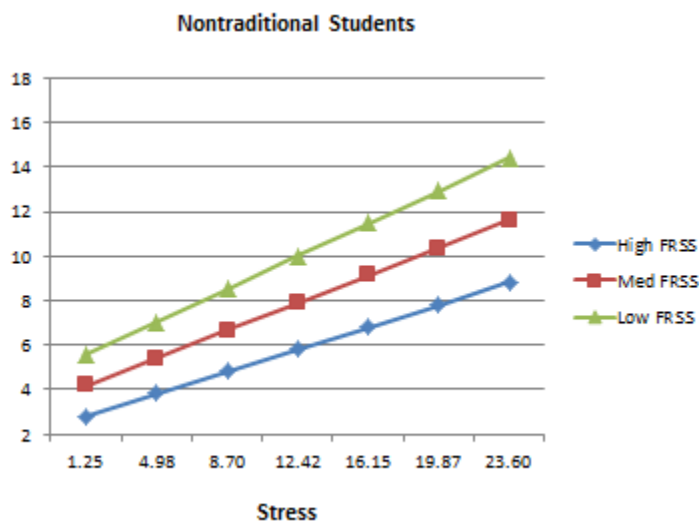
Parameter	B	Std. Error	t	Sig.
Intercept	6.675	.416	16.054	.000
[group=1]	1.367	.576	2.374	.018
[group=2]	0 <sup>a</sup>	.	.	.
stress_mcen	.332	.061	5.452	.000
frss_mcen	-1.416	.292	-4.845	.000
[group=1] * frss_mcen	-.095	.436	-.217	.829
[group=2] * frss_mcen	0 <sup>a</sup>	.	.	.
stress_mcen * frss_mcen	-.049	.036	-1.341	.181
[group=1] * stress_mcen	.083	.079	1.045	.297
[group=2] * stress_mcen	0 <sup>a</sup>	.	.	.
[group=1] * stress_mcen * frss_mcen	-.189	.058	-3.255	.000
[group=2] * stress_mcen * frss_mcen	0 <sup>a</sup>	.	.	.

a. This parameter is set to zero because it is redundant.



With the “traditionally aged” students we see “complete buffering” of the Stress → Depression relationship.

The slope of the Stress-Depression relationship is flat!



However, we see that there is considerably less “buffering” of the Stress → Depression relationship for the “Nontraditional” students!

