kxQ: Using GLM

```
Compute  numpract_cen  = numpract - 5.792.
exe.

*use numpract_cen -- will get group comparison at mean=0.
*with practice mean centered what was 5.792 (mean) is now 0
what was 2  is now (2 - 5.792) = -3.792
what was 4  is now (4 - 5.792) =  -1.792
what was 6  is now (6 - 5.792) =  .208
what was 8  is now (8 - 5.792) =  2.208
what was 10  is now (10 - 5.792) = 4,208.

UNIANOVA testperf   BY  practgrp_e1h2s3    WITH  numpract_cen
  /METHOD=SSTYPE(3)
  /EMMEANS=TABLES(practgrp_e1h2s3) WITH(numpract_cen = -3.792) COMPARE practgrp_e1h2s3)
  /EMMEANS=TABLES(practgrp_e1h2s3) WITH(numpract_cen = -1.792) COMPARE (practgrp_e1h2s3)
  /EMMEANS=TABLES(practgrp_e1h2s3) WITH(numpract_cen = .208)   COMPARE (practgrp_e1h2s3)
  /EMMEANS=TABLES(practgrp_e1h2s3) WITH(numpract_cen = 2.208)  COMPARE (practgrp_e1h2s3)
  /EMMEANS=TABLES(practgrp_e1h2s3) WITH(numpract_cen = 4.208)  COMPARE (practgrp_e1h2s3)
  /PRINT=DESCRIPTIVE PARAMETER
  /DESIGN= practgrp_e1h2s3    numpract_cen    practgrp_e1h2s3*numpract_cen.
```

Tests of Between-Subjects Effects

Dependent Variable: testperf

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	12036.352[a]	5	2407.270	25.522	.000
Intercept	167303.635	1	167303.635	1773.732	.000
practgrp_e1h2s3	3393.254	2	1696.627	17.987	.000
numpract_cen	1968.705	1	1968.705	20.872	.000
practgrp_e1h2s3* numpract_cen	6887.914	2	3443.957	36.512	.000
Error	3961.564	42	94.323		
Total	197300.000	48			
Corrected Total	15997.917	47			

a. R Squared = .752 (Adjusted R Squared = .723)

Parameter Estimates

Dependent Variable: testperf

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	64.756	2.557	25.324	.000	59.596	69.917
[practgrp_e1h2s3=1.00]	-16.038	3.564	-4.500	.000	-23.231	-8.845
[practgrp_e1h2s3=2.00]	3.732	3.536	1.055	.297	-3.404	10.868
[practgrp_e1h2s3=3.00]	0[a]	.	.	.	.	.
numpract_cen	3.292	.963	3.420	.001	1.349	5.235
[practgrp_e1h2s3=1.00] * numpract_cen	-6.812	1.357	-5.018	.000	-9.551	-4.072
[practgrp_e1h2s3=2.00] * numpract_cen	4.380	1.319	3.320	.002	1.718	7.042
[practgrp_e1h2s3=3.00] * numpract_cen	0[a]	.	.	.	.	.

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

1. practgrp_e1h2s3

Estimates

Dependent Variable: testperf

practgrp_e1h2s3	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Easy	62.064[a]	3.946	54.101	70.027
Hard	39.394[a]	3.982	31.358	47.431
Same	52.272[a]	5.072	42.036	62.508

a. Covariates appearing in the model are evaluated at the following values: numpract_cen = -3.79.

Pairwise Comparisons

Dependent Variable: testperf

(I) practgrp_e1h2s3	(J) practgrp_e1h2s3	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Easy	Hard	22.670*	5.606	.000	11.357	33.983
	Same	9.792	6.426	.135	-3.176	22.761
Hard	Easy	-22.670*	5.606	.000	-33.983	-11.357
	Same	-12.877	6.449	.052	-25.891	.136
Same	Easy	-9.792	6.426	.135	-22.761	3.176
	Hard	12.877	6.449	.052	-.136	25.891

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).

Univariate Tests

Dependent Variable: testperf

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	1548.256	2	774.128	8.207	.001
Error	3961.564	42	94.323		

The F tests the effect of practgrp_e1h2s3. This est is based on the linearly independent pairwise comparisons among the estimated marginal means.

2. practgrp_e1h2s3

Estimates

Dependent Variable: testperf

practgrp_e1h2s3	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Easy	55.025[a]	2.707	49.563	60.488
Hard	54.739[a]	2.779	49.130	60.348
Same	58.857[a]	3.505	51.783	65.930

a. Covariates appearing in the model are evaluated at the following values: numpract_cen = -1.79.

Fairwise Comparisons

Dependent Variable: testperf

(I) practgrp_e1h2s3	(J) practgrp_e1h2s3	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Easy	Hard	.286	3.880	.942	-7.543	8.116
	Same	-3.831	4.428	.392	-12.768	5.106
Hard	Easy	-.286	3.880	.942	-8.116	7.543
	Same	-4.117	4.473	.363	-13.145	4.910
Same	Easy	3.831	4.428	.392	-5.106	12.768
	Hard	4.117	4.473	.363	-4.910	13.145

Based on estimated marginal means

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

Univariate Tests

Dependent Variable: testperf

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	93.192	2	46.596	.494	.614
Error	3961.564	42	94.323		

The F tests the effect of practgrp_e1h2s3. This tet is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. practgrp_e1h2s3

Estimates

Dependent Variable: testperf

practgrp_e1h2s3	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Easy	47.986[a]	2.532	42.877	53.096
Hard	70.084[a]	2.469	65.100	75.067
Same	65.441[a]	2.502	60.393	70.490

a. Covariates appearing in the model are evaluated at the following values: numpract_cen = .21.

Pairwise Comparisons

Dependent Variable: testperf

(I) practgrp_e1h2s3	(J) practgrp_e1h2s3	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Easy	Hard	-22.097*	3.537	.000	-29.235	-14.960
	Same	-17.455*	3.559	.000	-24.637	-10.272
Hard	Easy	22.097*	3.537	.000	14.960	29.235
	Same	4.643	3.515	.194	-2.451	11.736
Same	Easy	17.455*	3.559	.000	10.272	24.637
	Hard	-4.643	3.515	.194	-11.736	2.451

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).

Univariate Tests

Dependent Variable: testperf

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	4060.060	2	2030030	21.522	.000
Error	3961.564	42	94323		

The F tests the effect of practgrp_e1h2s3. This tests based on the linearly independent pairwise comparisons among the estmated marginal means.

4. practgrp_e1h2s3

Estimates

Dependent Variable: testperf

practgrp_e1h2s3	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Easy	40.948[a]	3.580	33.722	48.173
Hard	85.429[a]	3.313	78.743	92.115
Same	72.026[a]	2.765	66.445	77.607

a. Covariates appearing in the model are evaluated at the following values: numpract_cen = 2.21.

Pairwise Comparisons

Dependent Variable: testperf

(I) practgrp_e1h2s3	(J) practgrp_e1h2s3	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Easy	Hard	-44.481*	4.878	.000	-54.325	-34.637
	Same	-31.078*	4.524	.000	-40.208	-21.949
Hard	Easy	44.481*	4.878	.000	34.637	54.325
	Same	13.403*	4.315	.003	4.694	22.112
Same	Easy	31.078*	4.524	.000	21.949	40.208
	Hard	-13.403*	4.315	.003	-22.112	-4.694

Based on estimated marginal means

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

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

Univariate Tests

Dependent Variable: testperf

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	8195.115	2	4097.557	43.442	.000
Error	3961.564	42	94.323		

The F tests the effect of practgrp_e1h2s3. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

5. practgrp_e1h2s3

Estimates

Dependent Variable: testperf

practgrp_e1h2s3	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Easy	33.909[a]	5.153	23.509	44.308
Hard	100.774[a]	4.729	91.231	110.316
Same	78.611[a]	4.056	70.425	86.796

a. Covariates appearing in the model are evaluated at the following values: numpract_cen = 4.21.

Pairwise Comparisons

Dependent Variable: testperf

(I) practgrp_e1h2s3	(J) practgrp_e1h2s3	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	UpperBound
Easy	Hard	-66.865*	6.994	.000	-80.979	52.751
	Same	-44.702*	6.558	.000	-57.936	31.467
Hard	Easy	66.865*	6.994	.000	52.751	80.979
	Same	22.163*	6.230	.001	9.590	34.735
Same	Easy	44.702*	6.558	.000	31.467	57.936
	Hard	-22.163*	6.230	.001	-34.735	-9.590

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).

Univariate Tests

Dependent Variable: testperf

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	8854.449	2	4427.224	46.937	.000
Error	3961.564	42	94.323		

The F tests the effect of practgrp_e1h2s3. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

```
UNIANOVA testperf   BY  practgrp_1s2h3e    WITH  numpract_cen
  /METHOD=SSTYPE(3)
  /PRINT=DESCRIPTIVE PARAMETER
  /DESIGN= practgrp_1s2h3e    numpract_cen    practgrp_1s2h3e*numpract_cen.
```

Parameter Estimates

Dependent Variable: testperf

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	48.719	2.483	19.623	.000	43.708	53.729
[practgrp_1s2h3e=1.00]	16.038	3.564	4.500	.000	8.845	23.231
[practgrp_1s2h3e=2.00]	19.770	3.483	5.677	.000	12.741	26.798
[practgrp_1s2h3e=3.00]	0[a]	.	.	.	.	.
numpract_cen	-3.519	.957	-3.678	.001	-5.451	-1.588
[practgrp_1s2h3e=1.00] * numpract_cen	6.812	1.357	5.018	.000	4.072	9.551
[practgrp_1s2h3e=2.00] * numpract_cen	11.192	1.315	8.512	.000	8.538	13.845
[practgrp_1s2h3e=3.00] * numpract_cen	0[a]	.	.	.	.	.

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

```
UNIANOVA testperf   BY  practgrp_e1s2h3    WITH  numpract_cen
  /METHOD=SSTYPE(3)
  /PRINT=DESCRIPTIVE PARAMETER
  /DESIGN= practgrp_e1s2h3    numpract_cen    practgrp_e1s2h3*numpract_cen.
```

Parameter Estimates

Dependent Variable: testperf

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	68.488	2.442	28.044	.000	63.559	73.417
[practgrp_e1s2h3=1.00]	-19.770	3.483	-5.677	.000	-26.798	-12.741
[practgrp_e1s2h3=2.00]	-3.732	3.536	-1.055	.297	-10.868	3.404
[practgrp_e1s2h3=3.00]	0[a]	.	.	.	.	.
numpract_cen	7.672	.902	8.508	.000	5.853	9.492
[practgrp_e1s2h3=1.00] * numpract_cen	-11.192	1.315	-8.512	.000	-13.845	-8.538
[practgrp_e1s2h3=2.00] * numpract_cen	-4.380	1.319	-3.320	.002	-7.042	-1.718
[practgrp_e1s2h3=3.00] * numpract_cen	0[a]	.	.	.	.	.

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

using practgrp_e1s2h3 gives practice regression slope for “Hard” of 7.672
using practgrp_e1h2s3 gives practice regression slope for “Same” of 3.292
using practgrp_1s2h3e gives practice regression slope for “Easy” of -3.519

					x std range	
height z1=0 z2=0	constant	64.756				
slope z1=0 z2=0	b(x)	3.292		Study	*z1 wt*	*Z2 wt*
height dif z1=1 z2=0	b(z1)	-16.038		Same	*0*	*0*
slope dif z1=1 z2=0	b(xz1)	-6.812		Easy	*1*	*0*
height dif z1=0 z2=1	b(z2)	3.732		Hard	0	1
slope dif z1=0 z2=1	b(xz2)	4.38				
	x(mean)	5.792				
	x(std)	2.681				

	(slope * X) +		height
Same	3.292	* X +	64.756
Easy	-3.52	* X +	48.718
Hard	7.672	* X +	68.488