SPSS MANOVA

The following SPSS code performs a MANOVA on three difference scores (post - pre) in the Kurlu data set. The CONTRAST statement in SPSS is a diabolical attempt to confuse everybody from the beginning student to the astute statistician. When one performs a contrast in SPSS, there must always be as many rows to the matrix as there are levels in the ANOVA factor. The first row should always be a row of 1s. The remaining rows (the second, third, and fourth in this case), give the substantive contrasts. Be very careful because the CONTRAST statement in other SPSS procedures works differently.

The TRANSFORM statement follows a similar logic. There must always be as many rows to the transformation matrix as there are dependent variables to be transformed. The TRANSFORM statement does not appear in point-and-click SPSS. It must be entered by hand into the Syntax window. Also, note that when a transformation is done, SPSS does not perform the MANOVA or individual ANOVAs on the original variables. It only does it for the transformed variables.

The MANOVA is actually performed by using the PRINT statement. Below, the PRINT statement requests the parameter estimates [PARAM(ESTIM)]; both multivariate and univariate tests of significance [SIGNIF(MULT UNIV)]; test of the homogeneity of variance-covariance matrices within groups [HOMOGENEITY(BARTLETT COCHRAN BOXM)]; and the pooled correlation matrix within groups [ERROR(CORR)].

The CINTERVAL statement calculates and prints confidence intervals (95% C.I.s, in this case) and uses simple univariate tests to determine significance levels for the means. The ERROR matrix specifies which error term to use, and the DESIGN statement gives the design to be analyzed. You can use more than one DESIGN statement. For example, one could test for main effects only and the second for both main effects and interactions.

```
-> MANOVA
->   si_impr sf_impr oi_impr  BY group(1 4)
->   /CONTRAST (group) = special( 1  1  1  1,
->                               -3  1  1  1,
->                                0 -2  1  1,
->                                0  0 -1  1)
->   /TRANSFORM (si_impr sf_impr oi_impr) = special (1  1  1,
->                                                   1 -1  0,
->                                                   0  1 -1)
->   /PRINT PARAM(ESTIM) SIGNIF(MULT UNIV )
          HOMOGENEITY(BARTLETT COCHRAN BOXM)
->        ERROR(CORR)
->   /CINTERVAL INDIVIDUAL(.95) UNIVARIATE
->   /METHOD=UNIQUE
->   /ERROR WITHIN+RESIDUAL
->   /DESIGN  .
```

```
* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

        40 cases accepted.
         0 cases rejected because of out-of-range factor values.
         0 cases rejected because of missing data.
         4 non-empty cells.

         1 design will be processed.

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              CELL NUMBER
                1    2    3    4
 Variable
   GROUP        1    2    3    4
```

The following section of code tests for the homogeneity of variance for the three transformed variables (T1 = Level, T2 = si_impr - sf_impr, and T3 = sf_impr - oi_impr). Why it does not give tests for homogeneity of variance for the original three variables (si_impr, sf_impr, oi_impr) is a mystery.

```
Univariate Homogeneity of Variance Tests

Variable .. T1
       Cochrans C(9,4) =                    .42314, P =  .219 (approx.)
       Bartlett-Box F(3,2333) =             .88552, P =  .448

Variable .. T2
      Cochrans C(9,4) =                     .46225, P =  .110 (approx.)
       Bartlett-Box F(3,2333) =            1.46240, P =  .223

Variable .. T3
       Cochrans C(9,4) =                    .29263, P = 1.000 (approx.)
       Bartlett-Box F(3,2333) =             .15506, P =  .926

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```

This section of output begins the tests for the homogeneity of the variance-covariance matrix. It begins by printing out the determinants and the log of the determinants for the covariance matrix for each cell in the ANOVA factor. These are very exciting numbers for some people, who often spend countless hours at TGIF parties discussing them.

```
Cell Number .. 1

Determinant of Covariance matrix of dependent variables =   194713.39808
LOG(Determinant) =                                              12.17928
 - - - - - - - - - -
Cell Number .. 2

Determinant of Covariance matrix of dependent variables =   185969.38642
LOG(Determinant) =                                              12.13334
```

```
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Cell Number .. 3

Determinant of Covariance matrix of dependent variables =    57582.90754
LOG(Determinant) =                                              10.96098
 - - - - - - - - - -
Cell Number .. 4
Determinant of Covariance matrix of dependent variables =   101439.35802
LOG(Determinant) =                                              11.52722
 - - - - - - - - - -

Determinant of pooled Covariance matrix of dependent vars. =
173813.31265
LOG(Determinant) =
12.06574

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```

These are the acutal tests for the homogeneity of the covariance matrices within groups. A perverted programmer decided to call these “Dispersion” matrices to continue the confusion.

```
Multivariate test for Homogeneity of Dispersion matrices

Boxs M =                          13.15917
F WITH (18,4579) DF =               .61819, P =   .889 (Approx.)
Chi-Square with 18 DF =           11.17920, P =   .887 (Approx.)

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WITHIN+RESIDUAL Correlations with Std. Devs. on Diagonal

                   T1         T2         T3
 T1             19.772
 T2              -.041      8.651
 T3               .216      -.598      9.405

Statistics for WITHIN+RESIDUAL correlations
Log(Determinant) =                 -.50346
Bartlett test of sphericity =    17.20161 with 3 D. F.
Significance =                     .001
F(max) criterion =                5.22359 with (3,36) D. F.
```

NOTE WELL: The following is the MANOVA for the transformed variables. If you want the MANOVA for the original variables, get rid of the TRANSFORM statement and rerun the program.

```
 * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. GROUP
Multivariate Tests of Significance (S = 3, M = -1/2, N = 16 )

 Test Name         Value  Approx. F Hypoth. DF   Error DF  Sig. of F
 Pillais          .63123    3.19776       9.00     108.00       .002
 Hotellings       .94953    3.44644       9.00      98.00       .001
 Wilks            .46438    3.41257       9.00      82.90       .001
 Roys             .38960
```

- -

The univariate statistics for the transformed variables:

```
EFFECT .. GROUP (Cont.)
Univariate F-tests with (3,36) D. F.

 Variable Hypoth. SS  Error SS Hypoth. MS  Error MS         F  Sig. of F
 T1      5123.00000 14073.4000 1707.66667 390.92778   4.36824       .010
 T2       901.40000 2694.20000  300.46667  74.83889   4.01485       .015
 T3      1205.80000 3184.60000  401.93333  88.46111   4.54362       .008

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```

NOTE EXTRAORDINARILY WELL: The following output gives the results for the CONTRAST, **NOT** post-hoc tests for the groups. The row labelled 2 gives the test for the second contrast (control group versus the mean of the three experimental groups), the row labelled 3 gives the results of the third contrast (cognitive versus the mean of the behavioral and the abreaction groups), and the row labelled 3 gives the results of the fourth contrast (behavioral versus abreaction). Why the output says Parameter instead of CONTRAST is another diabolical plot to confuse everyone.

```
Estimates for T1
 --- Individual univariate .9500 confidence intervals

GROUP

Parameter     Coeff.  Std. Err.  t-Value  Sig. t Lower -95%  CL- Upper
        2  72.4000000  21.65902  3.34272   .00195   28.47346  116.32654
        3  20.8000000  15.31524  1.35812   .18288  -10.26075   51.86075
        4  2.60000000   8.84226   .29404   .77041  -15.33293   20.53293

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 Estimates for T2
 --- Individual univariate .9500 confidence intervals

 GROUP

Parameter    Coeff.   Std. Err.   t-Value   Sig. t Lower -95%  CL- Upper
        2  -22.800000   9.47664  -2.40592   .02139  -42.01951   -3.58049
        3  -10.800000   6.70099  -1.61170   .11576  -24.39025    2.79025
        4  -7.4000000   3.86882  -1.91273   .06376  -15.24633     .44633

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 Estimates for T3
0 --- Individual univariate .9500 confidence intervals

 GROUP
Parameter     Coeff.  Std. Err.   t-Value   Sig. t Lower -95%  CL- Upper
        2  38.0000000  10.30307  3.68822   .00074   17.10440   58.89560
        3  -.10000000   7.28537  -.01373   .98912  -14.87542   14.67542
        4  -.70000000   4.20621  -.16642   .86876   -9.23059    7.83059

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```