Quiz #3 Example of Canonical Correlation

The purpose of the research was to examine the relationships between measures of mental health (depression, stress & loneliness) and social support (total, significant other, family & friend).

SPSS Code:

```
variable labels dep 'depression'
ruls 'loneliness'/
tss 'total social support'/
soss 'significant other social support'/
fass 'family social support'/
frss 'friend social support'.
corr tss fass frss soss dep ruls stress .
```

SPSS Output: Here is the correlation matrix, partitioned into the two sets of variables.

```
Correlations:  TSS        FASS       FRSS       SOSS       DEP        RULS      STRESS
              TSS         1.0000      .8280**    .8136**    .8569**    -.3691**    -.6282**    -.1849**
              FASS        .8280**    1.0000    .5192**    .5972**    -.3218**    -.4945**    -.2049**
              FRSS        .8136**    .5192**    1.0000    .6109**    -.3150**    -.5774**    -.1132
              SOSS        .8569**    .5972**    .6109**    1.0000    -.3044**    -.5266**    -.1291*
              DEP         -.3691**   -.3218**   -.3150**   -.3044**   1.0000    .5368**    .4872**
              RULS       -.6282**   -.4945**   -.5774**   -.5266**   .5368**   1.0000    .2846**
              STRESS     -.1849**   -.2049**   -.1132    -.1291*   .4872**   .2846**   1.0000

N of cases: 405    2-tailed Signif:  * - .01  ** - .001
```

SPSS Code: canonical correlation is available using syntax code for MANOVA, setting one set of variables as the “dependent” and the other set as the “covariates” with no “IVs”

```
manova tss fass frss soss with dep ruls stress   ← identifies the sets of variables
 /print signif(multiv dimenr eigen) ← asks for canonical analysis
 /discrim raw stan cor. ← requests info to interpret the canonicals
```

SPSS Output:

```
EFFECT . . WITHIN CELLS Regression
Multivariate Tests of Significance (S = 3, M = 0, N = 198 )

Test Name        Value  Approx. F Hypoth. DF  Error DF  Sig. of F

Pillais          .42888  16.68088  12.00     1200.00       .000   ← omnibus tests
Hotellings       .71377  23.59403  12.00     1190.00       .000
Wilks            .57895  20.14088  12.00     1053.30       .000
Roys             .40981

Dimension Reduction Analysis

Tests of each canonical
Roots  Wilks L.  F Hypoth. DF  Error DF  Sig. of F  Tests of each canonical
1 TO 3  .57895   20.14088  12.00     1053.30       .000   ← only 1st is statistically significant
2 TO 3  .98095   1.28534   6.00      798.00       .261
3 TO 3  .99873   .25506   2.00      400.00       .775
```
Eigenvalues and Canonical Correlations

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<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>.694</td>
<td>97.282</td>
<td>97.282</td>
<td>.640</td>
<td>.410</td>
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<tr>
<td>2</td>
<td>.018</td>
<td>2.539</td>
<td>99.821</td>
<td>.133</td>
<td>.018</td>
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<tr>
<td>3</td>
<td>.001</td>
<td>.179</td>
<td>100.000</td>
<td>.036</td>
<td>.001</td>
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</table>

Raw canonical coefficients

<table>
<thead>
<tr>
<th></th>
<th>Standardized canonical coeffs</th>
<th>Correlations between</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS</td>
<td>-0.440</td>
<td>-0.520</td>
</tr>
<tr>
<td>FASS</td>
<td>-0.062</td>
<td>-0.089</td>
</tr>
<tr>
<td>FRSS</td>
<td>-0.288</td>
<td>-0.376</td>
</tr>
<tr>
<td>SOSS</td>
<td>-0.065</td>
<td>-0.096</td>
</tr>
</tbody>
</table>

Raw canonical coefficients for COVARIATES

<table>
<thead>
<tr>
<th></th>
<th>Standardized canonical coeffs</th>
<th>Corrs between COVARIATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEP</td>
<td>.012</td>
<td>.080</td>
</tr>
<tr>
<td>RULS</td>
<td>.085</td>
<td>.969</td>
</tr>
<tr>
<td>STRESS</td>
<td>-.007</td>
<td>-.050</td>
</tr>
</tbody>
</table>

Interpretation is usually based on the combination of the standardized weights and the structure (as in ldf).

Variance explained by canonical variables of DEPENDENT variables (social support)

Tells us % of variance among the dependent variables accounted for by the dep and cov canonical variates, respectively

\[
Pc_1 = 0.76555 \quad R^2_c = 0.4100\]

Variance explained by canonical variables of the COVARIATES (mental health)

Tells us % of variance among the covariates accounted for dep and cov canonical variates, respectively

\[
Pc_1 = 0.4658 \quad R^2_c = 0.4100\]

Depiction of the “Variances Accounted For” in this Analysis

Dependent variables (social support)  
Covariate variables (mental health)

\[
1^{st} \text{“dependent” canonical variate} \quad R^2_c = 0.4100 \quad 1^{st} \text{“covariate” canonical variate}
\]

\[
covariate \text{ variable variance accounted for by dependent variate} \\
rd = R^2_c \times PC_{cov} = 0.41 \times 0.4658 = 0.1909
\]

\[
1^{st} \text{“dependent” canonical variate} \\
R^2_c = 0.4100
\]

\[
1^{st} \text{“covariate” canonical variate}
\]

\[
0.4658 = PC_{cov}
\]