The output from a principal components analysis performed on the dental calculus data is given in Figure 1.34.

Figure 1.34

```
EIGENVALUES OF WITHIN CELLS CORRELATION MATRIX

            EIGENVALUE      PCT OF VAR       CUM PCT

     1        2.02696        67.56528        67.56528
     2         .67398        22.46611        90.03139
     3         .29906         9.96861       100.00000

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

NORMALIZED PRINCIPAL COMPONENTS

          COMPONENTS

VARIABLES             1              2              3 .

RCAN            -.73816        -.65197        -.17338
RLI             -.90389         .08961         .41827
RCI             -.81551         .49081        -.30667

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DETERMINANT =                      .40855
BARTLETT TEST OF SPHERICITY =    87.87194 WITH 3 D. F.
SIGNIFICANCE =                     .000


F(MAX) CRITERION =               3.07466 WITH (3,100) D. F.
```

MANOVA also enables the user to rotate the principal components loadings. The keywords for specifying the type of rotation are VARIMAX, QUARTIMAX, and EQUIMAX (see *SPSS*, Second Edition, pp. 484-485, for a description of these three rotations). NOROTATE inhibits rotation. For example, if

```
PRINT=PRINCOMPS(COR,ROTATE(VARIMAX))/
```

is specified, a principal components analysis is performed on each error correlation matrix and the varimax method is used to rotate the component loadings. By default, all components are rotated. Fewer components may be rotated by specifying the number of components to be rotated, in parentheses, after the NCOMP keyword or by specifying a cutoff value for the eigenvalues, in parentheses, after the MINEIGEN keyword. For example, specifying

```
PRINT=PRINCOMPS(COR,ROTATE(VARIMAX),NCOMP(2))/
```

causes only the first two components to be rotated. If

```
PRINT=PRINCOMPS(COR,ROTATE(VARIMAX),MINEIGEN(1.5))/
```

is specified, only those components associated with eigenvalues greater than 1.5 will be rotated.

1.35   Discriminant Analysis

MANOVA can be used to perform discriminant analysis for each effect in the model. The PRINT subcommand requesting discriminant analysis has the format

```
PRINT=DISCRIM(output list)/
```

The output list may include requests for

1 The raw discriminant function coefficients. These are obtained for each tested effect by specifying

```
PRINT=DISCRIM(RAW)/
```

2 The standardized discriminant function coefficients. If

```
PRINT=DISCRIM(STAN)/
```

is specified, the standardized discriminant function coefficients (obtained by multiplying each raw coefficient by the corresponding standard deviation of the variable) will be printed.

3 The effect estimates in the discriminant function space. To obtain the estimates of each effect for the canonical variables, specify

```
PRINT=DISCRIM(ESTIM)/
```

The canonical variables are defined here as the canonical variates associated with the response variables.

4 The correlations between response variables and canonical variables. These are obtained by specifying

```
PRINT=DISCRIM(COR)/
```