

Notes and Comment

Power analysis for multivariate and repeated measurements designs via SPSS: Correction and extension of D'Amico, Neilands, and Zambarano (2001)

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D'Amico, Neilands, and Zambarano (2001) published SPSS syntax to perform power analyses for three complex procedures: ANCOVA, MANOVA, and repeated measures ANOVA. Unfortunately, the published SPSS syntax for performing the repeated measures analysis needed some minor revision in order to perform the analysis correctly. This article presents the corrected syntax that will successfully perform the repeated measures analysis and provides some guidance on modifying the syntax to customize the analysis.

This syntax runs a repeated measures analysis with three groups, each of which is measured at three occasions. However, the syntax presented below can be modified to perform an almost unlimited combination of groups and observations with slight modifications, which are described below.

```
MATRIX DATA variables = expgroup rowtype_ depress1  
depress2 depress3  
  /FACTORS = expgroup  
  /FORMAT = lower nodiagonal.  
BEGIN DATA  
1 mean 10 15 20  
1 N 30 30 30  
2 mean 10 12 15  
2 N 30 30 30  
3 mean 10 12 12  
3 N 30 30 30  
. sd 10 9 8  
. corr .3  
. corr .3 .3  
END DATA.  
MANOVA depress1 depress2 depress3 by expgroup (1, 3)  
  /WSFACTORS depress(3)  
  /METHOD UNIQUE  
  /ERROR WITHIN+RESIDUAL  
  /matrix = in(*)
```

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```
/POWER T (.05) F(.05)  
/PRINT SIGNIF(MULT AVERF)  
/NOPRINT PARAM (ESTIM).
```

The following are notes and annotations on using this syntax to perform a power analysis.

1. All syntax lines with a / need to be indented at least one space for this SPSS syntax to run properly.

2. The first variable named on the *MATRIX DATA* command (*expgroup*, in this example) needs to be identical to the variable named on the */FACTORS* subcommand.

3. Under the *BEGIN DATA* command, each group gets two lines, both of which have to begin with the group number (1, 2, or 3, in this example). The first line lists the three means for the three repeated measures for that particular group. The second line lists the *N* for that group that the mean is based on. In these examples the *N*s are all identical, but in actual practice they can be different. Thus, if one were doing a post hoc power analysis (or one wanted a power analysis given a projected number of dropouts per group) and one subject dropped out after the first observation, the second line would read

```
1 N 30 29 29
```

4. To add more repeated observations per group:
a. Add more variables under the *MATRIX DATA* command to represent the repeated measures (*depress1 depress2 depress3* are the first three variable names in this example; *depress4* could be the next). This list of variables representing the repeated observations needs to match the list of variables on the first line of the *MANOVA* command.

b. Add the extra means and *N*s to each data line.

c. Add the extra standard deviations for the other observations near the bottom of the data statement.

d. Adjust the correlation matrix to represent the lower half of the correlation matrix of the correlations among all the observation variables.

e. Under *MANOVA*, under the */WSFACTORS* subcommand, change the 3 to however many repeated observations there are.

5. To add more groups, then, one would have to add two more lines for each group.

a. These lines would be added immediately before the *SD* line.

b. The number of groups needs to be changed on the *MANOVA* command at the end [change *expgroup (1, 3)* to *expgroup (1, x)*, where *x* is the new number of groups].

6. For this analysis (which was an actual a priori power analysis performed for inclusion in a grant application),

the effect was posited to be approximately 1.0 standard deviations (change in the mean of 10 with an *SD* of approximately 10) for Group 1, 0.5 standard deviations for Group 2, and 0.2 standard deviations for Group 3. Depending on the hypotheses being tested, these values should be adjusted by altering the means, the standard deviations, or both. If this is a post hoc analysis, actual means, standard deviations, and correlations should be substituted.

REFERENCE

- D'AMICO, E. J., NEILANDS, T. B., & ZAMBARANO, R. (2001). Power analysis for multivariate and repeated measures designs: A flexible approach using the SPSS MANOVA procedure. *Behavior Research Methods, Instruments, & Computers*, **33**, 479-484.

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