

MSc Applied Social and Health Psychology

Applied Research, Ethics, and Analysis (AREA)

Analysis of Covariance (ANCOVA)

Multivariate Analysis of Variance (MANOVA).

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Essential Reading

- Brace, N., Kemp, R., & Snelgar, R. (2016). *SPSS for Psychologists* (6th ed.). Hants: Palgrave Macmillan.
- Coolican, H. (2014). *Research methods and statistics in psychology*. London: Taylor & Francis.
- Pallant, J. (2016). *SPSS Survival Manual* (6th ed.). McGraw Hill .
 - Earlier versions of the above books will also be suitable.

Analysis of Covariance (ANCOVA)

- Allows examination of the effect of an IV on a DV whilst **partialling out** or removing effect of another variable.
- Essentially, is the same as ANOVA (i.e., looks at effect of IV on DV) but also acknowledges influence of another variable:
 - Known as a **Covariate**.

ANCOVA

- Uses regression equation to measure influence of a covariate.
- Can use ANCOVA if you identify a variable that was not part of your manipulation and yet has an influence on your DV
 - This would get rid of the effects of this covariate and reduce the error variance.
 - Remember: ANOVA compares amount of variance from our manipulation of IV against error variance –
 - I.e., variance from other ‘nuisance variables’

ANCOVA

- Also possible to use ANOCVA when means of the covariate differ significantly.
- E.g., one group differs to another already, based on some pre-experimental factor.
- ANCOVA adjusts the means on the DV to estimate what they would have been if the groups had not differed to begin with.
- These adjusted means are a best guess as to what the means would have been had the groups not differed on the covariate.

When to use ANCOVA

- When you have one or more between-subjects factor.
- When participants have been randomly assigned to one of the levels of the IV.
- When you have a pre-test post-test design.
- Note: It is possible to have more than one covariate but interpreting the output from such an analysis would be difficult.

Checks for Choosing a Covariate

1. Based on existing theory and research
2. Should be measured using a scale at ratio, interval or ordinal level
3. Should be measured before manipulation
4. Should be measured reliably
5. Relationship between covariate and DV should be linear
6. Should have homogeneity of regression
7. Should have all the assumptions of an ANOVA

ANCOVA Worksheet

- Please use your SPSS Textbooks to follow the steps on how to conduct ANCOVA and to help you write-up the results as you would for a report.

Multivariate Analysis of Variance (MANOVA)

- Used when there is more than one Dependent Variable (DV).
- Similar to ANOVA in that it can explore the effects of multiple IVs and their interactions.
- However, MANOVA can handle several DVs simultaneously.
- Tells you if there is any relationship between the different DVs.

MANOVA

- Can check whether different levels of a factor not only differ from one another on one DV but whether they differ along a combination of several DVs.
- It does this by creating a new DV which is the linear combination of each of the original DVs.
- Why not just conduct a series of separate ANOVAs for each DV?
 - Increase chance of Type I error

When to use MANOVA?

- Can be used with simple one-way designs and with complex multifactorial designs.
- Must have a solid reason for examining more than one DV in a single analysis.
 - Because adding many DVs can decrease the power of the test.
- There is controversy over the extent to which the DVs can or should be correlated.
- Multicollinearity should be avoided so check that the correlation coefficients for any pair of DVs do not exceed 0.90.

When to use MANOVA?

- DVs should not be correlated with each other.
- Each DV should measure different aspects.
- If a MANOVA result is significant but the DVs correlate then it is difficult to assign contribution of each individual DV to the overall effect.

Also Check the following...

- DVs should be continuous or discrete and any relationship between them should be linear.
- The number of cases in each cell is greater than the number of DVs.
- There should be homogeneity of variance-covariance matrices (SPSS can check this).
- There should be univariate and multivariate normality of distributions.

Remember....

- Before conducting a MANOVA check to see if the DVs are correlated.
- All correlations should be **not**-significant in order to continue.

MANOVA Worksheet

Please use your SPSS Textbooks to follow the steps on how to conduct a MANOVA and to help you write-up the results as you would for a report.

Good Practice in SPSS

- If you don't need decimal places, then in Variable view best change this to 0.
- Always ask for Descriptive statistics.
- In the 'Options' dialogue box, always ask for:
 - 'Estimates of effect size' which tells you the proportion of total variance accounted for by the factor (ANOVA).
 - 'Homogeneity tests' – you can proceed and assume homogeneity if Levene's test is **not** significant.