What is the purpose of performing a one-way Manova in SPSS data analysis?

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The purpose of performing a one-way Manova in SPSS data analysis is to determine if there is a significant difference between two or more independent groups on multiple dependent variables. This statistical test allows researchers to assess the overall effect of the independent variable(s) on the dependent variables, while controlling for any potential confounding variables. It is particularly useful in research studies that involve measuring multiple outcomes or variables, as it can provide a more comprehensive understanding of the relationship between the independent and dependent variables. Additionally, the results of a one-way Manova can aid in identifying which specific dependent variables contribute most significantly to the overall group differences. Overall, performing a one-way Manova in SPSS can provide valuable insights and inform further analysis and interpretation of research findings.

One-way Manova | SPSS Data Analysis Examples

Version info: Code for this page was tested in IBM SPSS 20.

MANOVA is used to model two or more dependent variables that are continuous with one or more categorical predictor variables.

Please note: The purpose of this page is to show how to use various data analysis commands. It does not cover all aspects of the research process which researchers are expected to do. In particular, it does not cover data cleaning and checking, verification of assumptions,

model diagnostics or
potential follow-up analyses.

Examples of one-way multivariate analysis of variance

Example 1.

A researcher randomly assigns 33 subjects to one of three groups. The first group
receives technical dietary information interactively from an on-line website. Group
2 receives the same information from a nurse practitioner, while group 3 receives the
information from a video tape made by the same nurse practitioner. The
researcher looks
at three different ratings of the presentation, difficulty, usefulness and importance, to determine
if there is a difference in the modes of presentation. In particular, the researcher is
interested in whether the interactive website is superior because that is the most cost-effective
way of delivering the information.

Example 2. A clinical psychologist recruits 100 people

who suffer from
panic disorder into his study. Each subject receives one of four types of
treatment for eight weeks. At the end of treatment, each subject
participates in a structured interview, during which the clinical psychologist
makes three ratings: physiological, emotional and cognitive. The
clinical psychologist wants to know which type of treatment most reduces the
symptoms of the panic disorder as measured on the physiological, emotional and
cognitive scales. (This example was adapted from Grimm and Yarnold, 1995,
page 246.)

Description of the data

Let's pursue Example 1 from above.

We have a data file, manova.sav, with 33 observations on three response
variables. The response variables are ratings called useful, difficulty and importance. Level 1 of the group

variable is the treatment group, level 2 is control group 1 and
level 3 is control group 2.

Let's look at the data. It is always a good idea to start with descriptive
statistics.

```
get file='d:datamanova.sav' .

descriptives
variables=difficulty useful importance.
```

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
DIFFICULTY	33	2.40	10.25	5.7152	2.01760
USEFUL	33	11.90	24.30	16.3303	3.29246
IMPORTANCE	33	.20	18.80	6.4758	3.98513
Valid N (listwise)	33				


```
frequencies
variables=group.
```

Statistics

GROUP

N	Valid	33
	Missing	0

GROUP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	11	33.3	33.3	33.3
	2.00	11	33.3	33.3	66.7
	3.00	11	33.3	33.3	100.0
	Total	33	100.0	100.0	

means tables=difficulty useful importance by group.

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
difficulty * group	33	100.0%	0	0.0%	33	100.0%
useful * group	33	100.0%	0	0.0%	33	100.0%
importance * group	33	100.0%	0	0.0%	33	100.0%

Report

group		difficulty	useful	importance
treatment	Mean	6.1909	18.1182	8.6818
	N	11	11	11
	Std. Deviation	1.89971	3.90380	4.86309
control_1	Mean	5.5818	15.5273	5.1091
	N	11	11	11
	Std. Deviation	2.43426	2.07562	2.53119
control_2	Mean	5.3727	15.3455	5.6364
	N	11	11	11
	Std. Deviation	1.75903	3.13827	3.54691
Total	Mean	5.7152	16.3303	6.4758
	N	33	33	33
	Std. Deviation	2.01760	3.29246	3.98513

correlations variables=difficulty useful importance.

Correlations

		difficulty	useful	importance
difficulty	Pearson Correlation	1	.098	.198
	Sig. (2-tailed)		.588	.270
	N	33	33	33
useful	Pearson Correlation	.098	1	-.341
	Sig. (2-tailed)	.588		.052
	N	33	33	33
importance	Pearson Correlation	.198	-.341	1
	Sig. (2-tailed)	.270	.052	
	N	33	33	33

Analysis methods you might consider

Below is a list of some analysis methods you may have encountered. Some of the methods listed are quite reasonable, while others
have either fallen out of favor or have limitations.

One-way MANOVA

We will start by running the manova command. After the
categorical predictor variable group, we need to specify the minimum and
maximum values of that variable in parentheses.

manova difficulty useful importance by group(1,3).

- -

The default error term in MANOVA has been changed from WITHIN CELLS to
WITHIN+RESIDUAL. Note that these are the same for all full factorial designs.

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

33 cases accepted.

0 cases rejected because of out-of-range factor values.

0 cases rejected because of missing data.

3 non-empty cells.

1 design will be processed.

- -

*** * * * * * * * * * * * * * * * * 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 = 2, M = 0, N = 13)

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

Pillais .47667 3.02483 6.00 58.00 .012

Hotellings .89723 4.03753 6.00 54.00 .002

Wilks .52579 3.53823 6.00 56.00 .005

Roys .47146

Note.. F statistic for WILKS' Lambda is exact.

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EFFECT .. GROUP (Cont.)

Univariate F-tests with (2,30) D. F.

Variable Hypoth. SS Error SS Hypoth. MS Error MS F Sig. of F

DIFFICUL 3.97515 126.28728 1.98758 4.20958 .47216 .628

USEFUL 52.92424 293.96544 26.46212 9.79885 2.70053 .083

IMPORTAN 81.82969 426.37090 40.91485 14.21236 2.87882 .072

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Abbreviated Extended

Name Name

DIFFICUL DIFFICULTY

IMPORTAN IMPORTANCE

We will begin by comparing the treatment group (group 1) to an average of the

control groups (groups 2 and 3). This tests the hypothesis that the mean
of the control groups equals the treatment group. We will also compare control
group 1 (group 2) to control group 2 (group 3). The first hypothesis is
given on the second line of the contrast subcommand, and the second
hypothesis is given on the third line of the contrast subcommand.

```
manova difficulty useful importance by group(1,3)
/contrast(group) = special (1 1 1
2 -1 -1
0 1 -1)
/design = group(1) group(2).

< some output omitted >

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

EFFECT .. GROUP(1)
Multivariate Tests of Significance (S = 1, M = 1/2, N = 13
)
```

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

Pillais .47101 8.31034 3.00 28.00 .000
Hotellings .89039 8.31034 3.00 28.00 .000
Wilks .52899 8.31034 3.00 28.00 .000
Roys .47101
Note.. F statistics are exact.

- -
EFFECT .. GROUP(1) (Cont.)
Univariate F-tests with (1,30) D. F.

Variable Hypoth. SS Error SS Hypoth. MS Error MS F Sig. of F

DIFFICUL 3.73470 126.28728 3.73470 4.20958 .88719 .354
USEFUL 52.74242 293.96544 52.74242 9.79885 5.38251 .027
IMPORTAN 80.30060 426.37090 80.30060 14.21236 5.65005 .024

< some output omitted >

< some output omitted >

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

EFFECT .. GROUP(2)
Multivariate Tests of Significance (S = 1, M = 1/2, N = 13)

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

Pillais .00679 .06381 3.00 28.00 .979
Hotellings .00684 .06381 3.00 28.00 .979
Wilks .99321 .06381 3.00 28.00 .979
Roys .00679
Note.. F statistics are exact.

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EFFECT .. GROUP(2) (Cont.)
Univariate F-tests with (1,30) D. F.

Variable Hypoth. SS Error SS Hypoth. MS Error MS F Sig. of F

DIFFICUL .24045 126.28728 .24045 4.20958 .05712 .813

USEFUL .18182 293.96544 .18182 9.79885 .01856 .893
IMPORTAN 1.52909 426.37090 1.52909 14.21236 .10759 .745

- -

< some output omitted >

We can use the pmeans subcommand to obtain adjusted predicted values for
each of the groups. In the first table below, we get the predicted means
for the dependent variable difficulty. In the next two tables, we
get the predicted means for the dependent variables useful and
importance. These values can be helpful in seeing where differences
between levels of the predictor variable are and describing the model.

manova difficulty useful importance by group(1,3)
/pmeans.

< some output omitted >

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Adjusted and Estimated Means
Variable .. DIFFICULTY
Factor Code Obs. Mean Adj. Mean Est. Mean Raw Resid. Std. Resid.

GROUP 1 6.19091 6.19091 6.19091 .00000 .00000
GROUP 2 5.58182 5.58182 5.58182 .00000 .00000
GROUP 3 5.37273 5.37273 5.37273 .00000 .00000

- -

Adjusted and Estimated Means (Cont.)
Variable .. USEFUL
Factor Code Obs. Mean Adj. Mean Est. Mean Raw Resid. Std. Resid.

GROUP 1 18.11818 18.11818 18.11818 .00000 .00000
GROUP 2 15.52727 15.52727 15.52727 .00000 .00000
GROUP 3 15.34545 15.34545 15.34545 .00000 .00000

- -

Adjusted and Estimated Means (Cont.)
Variable .. IMPORTANCE
Factor Code Obs. Mean Adj. Mean Est. Mean Raw Resid. Std. Resid.

GROUP 1 8.68182 8.68182 8.68182 .00000 .00000
GROUP 2 5.10909 5.10909 5.10909 .00000 .00000
GROUP 3 5.63636 5.63636 5.63636 .00000 .00000

- -

< some output omitted >

In each of the three tables above, we see that the predicted means for groups 2 and 3 are very similar; the predicted mean for group 1 is higher than those for groups 2 and 3.

In the example below, we obtain the differences in the means for each of the

dependent variables for each of the control groups (groups 2 and 3) compared to
the treatment group (group 1). With respect to the dependent variable
difficulty, the difference between the means for control group 1 versus the
treatment group is approximately -0.61 (5.58 - 6.19). The difference
between the means for control group 2 versus the treatment group is
approximately -0.82 (5.37 - 6.19).

manova difficulty useful importance by group(1,3)
/contrast(group) = special(1 1 1
-1 1 0
-1 0 1).

< some output omitted >

- -

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

GROUP

Parameter Coeff. Std. Err. t-Value Sig. t Lower -95% CL- Upper

2 -.6090908051 .87486 -.69622 .49165 -2.39579 1.17761
3 -.8181818182 .87486 -.93522 .35714 -2.60488 .96852

- -

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

GROUP

Parameter Coeff. Std. Err. t-Value Sig. t Lower -95% CL- Upper

2 -2.5909088308 1.33477 -1.94109 .06169 -5.31687 .13505
3 -2.7727272727 1.33477 -2.07731 .04643 -5.49869 -.04676

- -

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

GROUP

Parameter Coeff. Std. Err. t-Value Sig. t Lower -95% CL- Upper

2 -3.5727272291 1.60750 -2.22253 .03393 -6.85569 -.28977

3 -3.0454544317 1.60750 -1.89452 .06783 -6.32841 .23750

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< some output omitted >

Finally, let's run separate univariate ANOVAs.

oneway useful difficulty importance by group.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
USEFUL	Between Groups	52.924	2	26.462	2.701	.083
	Within Groups	293.965	30	9.799		
	Total	346.890	32			
DIFFICULTY	Between Groups	3.975	2	1.988	.472	.628
	Within Groups	126.287	30	4.210		
	Total	130.262	32			
IMPORTANCE	Between Groups	81.830	2	40.915	2.879	.072
	Within Groups	426.371	30	14.212		
	Total	508.201	32			

While none of the three ANOVAs were statistically significant at the alpha = .05 level,
in particular, the F-ratio for difficulty was less than 1.

Things to consider

See also

References