

The MANOVA for Dependent Groups -- Analysis of k-Within-Group Data with Two or More Quantitative DVs

Application: To compare means of two or more quantitative variables obtained from 2 or more dependent groups.

Research Hypothesis: In a previous study the proposed that performance in a constant noise condition would be poorer and slower. While the hypotheis that performance would be poorer was supported, there was no difference between the speed at which the task was completed in the two noise conditions. In this study the researcher added a random intermittent noise condition (2 randomly selected 10-second noise periods each minute) to the systematic intermittent noise condition (noise during the 1st and 4th 10-second periods of each minute) and constant noise conditions. A third DV was also added -- a confidence rating. It was hypothesized that for the error DV, there would be the most errors from the constant noise condition, followed by the random intermittent noise condition, with the fewest errors from the systematic noise condition. For the speed DV (for which higher scores indicate greater speed), it was hypothesized that there would be no mean differences across the IV conditions. Finally, for the confidence DV, it was hypothesized that the lowest confidence rating would come from the constant noise condition, the highest from the systematic noise condition, and an intermediate level of confidence from the random intermittent noise condition.

SPSS Code

```
data list free / sinterr rinterr consterr
               sintspd rintspd constspd
               sintcon rintcon constcon.

variable labels  sinterr 'errors - systematic intermittent noise condition'
                 / rinterr 'errors - random interittent noise condition'
                 / consterr 'errors - constant noise condition'
                 / sintspd 'speed - systematic intermittent noise condition'
                 / rintspd 'speed - random intermittent noise condition'
                 / constspd 'speed during constant noise condition'
                 / sintcon 'confidence - systematic intermittent noise condition'
                 / rintcon 'confidence = random intermittent noise condition'
                 / constcon 'confidence - constant noise condition'.

begin data.
19 38 24 110 80 114 9 6 3
26 36 31 120 78 112 10 7 5
18 40 27 130 81 132 9 9 4
17 37 29 110 86 103 8 5 6
20 39 33 98 74 86 10 7 5
20 38 25 119 80 125 9 7 2
end data.
```

There are nine variables for each participant -- each of three DVs measured during the completion of each of three IV conditions.

Research Hypotheses:

DV = errors:

sys vs. random sys. vs. constant random vs. constant

< < <

DV = speed (larger is better):

sys vs. random sys. vs. constant random vs. constant

DV = confidence:

sys vs. random sys. vs. constant random vs. constant

```
manova sinterr rinterr consterr
/wsfactors noise (3)
/print signif(avonly).
```

Tests involving 'NOISE' Within-Subject Effect.

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN CELLS	77.89	10	7.79		
NOISE	974.78	2	487.39	62.57	.000

```
t-test pairs = sinterr rinterr consterr.
```

Variable	Mean	SD
SINTERR errors - systematic intermitt	20.0000	3.162
RINTERR errors - random interittent n	38.0000	1.414

t-value	df	2-tail Sig
-10.63	5	.000

Variable	Mean	SD
SINTERR errors - systematic intermitt	20.0000	3.162
CONSTERR errors - constant noise cond	28.1667	3.488

t-value	df	2-tail Sig
-5.39	5	.003

Variable	Mean	SD
RINTERR errors - random interittent n	38.0000	1.414
CONSTERR errors - constant noise cond	28.1667	3.488

t-value	df	2-tail Sig
6.07	5	.002

Analysis of the error DV data -- there is a significant effect for this DV.

Pairwise follow-ups for error DV - t-test will analyze all pairs of the DVs

Results:

LSD - use the p-values given in the t-test output (be sure to look at the means to compare the hypothesized effect with the obtained effect)

sys vs. random	sys. vs. constant	random vs. constant	
<	<	>	partial support

Bonferroni - divide .05 by the number of comparisons and use that value to retain/reject H0: for each t-test (.05/3 = .0167)

sys vs. random	sys. vs. constant	random vs. constant	
<	<	>	partial support

Found same results from the two tests -- partial support for RH:

```
manova sintspd rintspd constspd
/wsfactors noise (3)
/print signif(avonly).
```

Tests involving 'NOISE' Within-Subject Effect.

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN CELLS	655.22	10	65.52		
NOISE	4485.44	2	2242.72	34.23	.000

```
t-test pairs = sintspd rintspd constspd.
```

Variable	Mean	SD
SINTSPD speed - systematic intermitt	114.5000	10.986
RINTSPD speed - random intermittent	79.8333	3.920

t-value	df	2-tail Sig
8.27	5	.000

Variable	Mean	SD
SINTSPD speed - systematic intermitt	114.5000	10.986
CONSTSPD speed during constant noise	112.0000	16.310

t-value	df	2-tail Sig
.82	5	.447

Variable	Mean	SD
RINTSPD speed - random intermittent	79.8333	3.920
CONSTSPD speed during constant noise	112.0000	16.310

t-value	df	2-tail Sig
-5.17	5	.004

The hypothesized pattern for speed was:

sys vs. random sys. vs. constant random vs. constant

The LSD results were:

sys vs. random sys. vs. constant random vs. constant

The Bonferroni results were:

Bonferroni p-value to use _____-

sys vs. random sys. vs. constant random vs. constant

Describe any difference between the LSD and Bonferroni results:

Support for this part of the research hypothesis was:

complete partial no support

```
manova sintcon rintcon constcon
/wsufactors noise (3)
/print signif(avonly).
```

```
Tests involving 'NOISE' Within-Subject Effect.
Source of Variation      SS      DF      MS      F      Sig of F
WITHIN CELLS            15.56    10     1.56
NOISE                    75.11     2    37.56    24.14    .000
```

```
t-test pairs = sintcon rintcon constcon.
```

Variable	Mean	SD
SINTCON confidence - systematic inter	9.1667	.753
RINTCON confidence = random intermitt	6.8333	1.329

t-value	df	2-tail Sig
4.72	5	.005

Variable	Mean	SD
SINTCON confidence - systematic inter	9.1667	.753
CONSTCON confidence - constant noise	4.1667	1.472

t-value	df	2-tail Sig
7.32	5	.001

Variable	Mean	SD
RINTCON confidence = random intermitt	6.8333	1.329
CONSTCON confidence - constant noise	4.1667	1.472

t-value	df	2-tail Sig
2.90	5	.034

The hypothesized pattern for confidence was:

sys vs. random sys. vs. constant random vs. constant

The LSD results were:

sys vs. random sys. vs. constant random vs. constant

The Bonferroni results were:

Bonferroni p-value to use _____-

sys vs. random sys. vs. constant random vs. constant

Describe any difference between the LSD and Bonferroni results:

Support for the research hypothesis was:

complete partial no support

For the Write-up: You should follow the examples from the k-between group write-ups. Variables, Table of stats, ANOVA and follow-ups for each DV, summary of support/non-support of the research hypothesis.