

## Simple Effects Test Following a Significant Interaction

Simple effects tests are follow-up tests when the interaction is significant. They explore the nature of the interaction by examining the difference between groups within one level of one of the independent variables. For example, if there was a significant interaction between violence and training, a simple effects test would compare the difference between violence and no violence conditions for those people who did not receive eyewitness training. Note that there is no reason to conduct a simple effects test when the interaction is nonsignificant.

The easiest way to conduct a simple effects test following a significant interaction is to use the MANOVA command in SPSS. MANOVA, which stands for multivariate analysis of variance, is only available through syntax. We are not really conducting a multivariate analysis of variance here, because there is only one dependent variable involved. However, this older SPSS command was used to conduct a number of different kinds of analyses prior to the addition of windows menus and the GLM procedure.

### Syntax<sup>1</sup>

Below, I provide the syntax for testing the simple effect of violence within the no training group.

	1 No training	2 Training	
1 No violence	4.0	8.0	6.0
2 Violence	2.0	2.0	2.0
	3.0	5.0	4.0

For the violence factor 1=no violence, 2=violence. For the training factor, 1=no training and 2=training. To test a simple effect, the following syntax commands are used:

```
MEANS VARS=memory by violence by training.
```

```
MANOVA memory BY violence(1,2) training(1,2)  
  /ERROR=WITHIN  
  /DESIGN  
  /DESIGN=violence WITHIN training(1).
```

The MEANS command simply generates means for all the cells and the marginal means. They can be obtained with an OMEANS subcommand in MANOVA, but I like the presentation with the MEANS command better.

The MANOVA line lists the dependent variable first and then the two factors. After each factor, the upper and lower values for that independent variable are listed in parentheses. The second subcommand, /ERROR=WITHIN, specifies the error term to use and is always the same in any problem. The first /DESIGN subcommand generates the full ANOVA (which you may or may not always want). The second /DESIGN command, /DESIGN=violence WITHIN training(1), generates the simple effects test by specifying that the two levels of violence should be compared within the first level of training. The (1) in this statement refers to the first level of the training variable rather than the group coded 1. If training had been coded 0=no training and 1=training, the (1) in this statement would instruct SPSS to test the simple effect within the no training group (i.e., the group coded 0).

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<sup>1</sup> This example is based on syntax provided by Page, C., Braver, S.L., & MacKinnon, D.P. (2003). *Levine's guide to SPSS for analysis of variance* (2<sup>nd</sup> Edition). Mahway, NJ: Erlbaum.

Note that the advantage of this type of analysis over separate t-tests is that t-tests will only use half of the subjects to compute the error term and will only be based on half the df. Using simple effects tests will use the within-cell variation for all the cases in the data set and will result in a smaller and more reliable error term, thus leading to higher power.

## Means

### Report

MEMORY memory for assailant

VIOLENCE violent	TRAINING received	Mean	N	Std. Deviation
1.00 no violence	1.00 no training	4.0000	5	.70711
	2.00 training	8.0000	5	1.22474
	Total	6.0000	10	2.30940
2.00 violence	1.00 no training	2.0000	5	1.22474
	2.00 training	2.0000	5	1.22474
	Total	2.0000	10	1.15470
Total	1.00 no training	3.0000	10	1.41421
	2.00 training	5.0000	10	3.36650
	Total	4.0000	20	2.71448

## Manova

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

20 cases accepted.  
 0 cases rejected because of out-of-range factor values.  
 0 cases rejected because of missing data.  
 4 non-empty cells.  
 2 designs will be processed.

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

Tests of Significance for MEMORY using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN CELLS	20.00	16	1.25		
VIOLENCE	80.00	1	80.00	64.00	.000
TRAINING	20.00	1	20.00	16.00	.001
VIOLENCE BY TRAINING	20.00	1	20.00	16.00	.001
(Model)	120.00	3	40.00	32.00	.000
(Total)	140.00	19	7.37		

R-Squared = .857  
 Adjusted R-Squared = .830

\* \* \* \* \* A n a l y s i s o f V a r i a n c e -- design 2 \* \* \* \* \*

Tests of Significance for MEMORY using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN CELLS	20.00	16	1.25		
VIOLENCE WITHIN TRAI NING(1)	10.00	1	10.00	8.00	.012