

A psychologist wanted to study learning across time for familiar and new words. Four students agreed to participate in a research study. Each participant was shown a list of 20 words and then asked to recall as many words from the list that they could. This same word list was shown to the participants three times. The psychologist wanted to know if recall improved across time and whether recall was better for familiar or new words. Recall **accuracy** was measured as the number of words correctly recalled from the list. The participants' data and the initial SPSS analysis are attached.

**Write an APA results section that summarizes the results of the initial UNIVARIATE analyses. (Omit descriptive statistics and omega square values.) Use an alpha of .05.**

**A portion of the SPSS output has been deleted. Specifically, the multivariate  $F$  test of time is missing. Conduct the MULTIVARIATE test of time, including the  $F$ , critical value, determining whether the test is significant, and the APA interpretation. Show your work. Use an alpha of .05.**

**The initial analysis conducted by the researcher needs to be supplemented. What additional analyses need to be conducted by the researcher? State the statistical test(s) to be conducted, the alpha level used for the test(s), and describe the data to be analyzed.**

Explain why it is inappropriate to use a one-way between-subjects anova to analyze data from a one-way repeated measures design.

Participants were randomly assigned to one of three training conditions (self-study, lecture, or mentor). Their performance on a mastery test was measured on three occasions after training (1 week after, 2 weeks after, 3 weeks after).

**What is the variance or sphericity assumption for the test of training?**

**Which method(s) would be used to conduct pairwise comparisons for the test of training?**

**What is the variance or sphericity assumption for the test of time?**

**Which method(s) would be used to conduct pairwise comparisons for the test of time?**

USE FOR HAND CALCULATIONS REQUIRED ON PAGE 2

Recall Accuracy data for the participants					
T1		T2		T3	
New	Familiar	New	Familiar	New	Familiar
3	5	4	8	4	10
2	4	4	8	10	8
6	6	6	4	8	10
3	3	4	10	5	9

## SPSS output

### General Linear Model

Within-Subjects Factors

Measure: Accuracy

Time	Words	Dependent Variable
1	1	T1New
	2	T1Familiar
2	1	T2New
	2	T2Familiar
3	1	T3New
	2	T3Familiar

Descriptive Statistics

	Mean	Std. Deviation	N
T1New	3.5000	1.73205	4
T1Familiar	4.5000	1.29099	4
T2New	4.5000	1.00000	4
T2Familiar	7.5000	2.51661	4
T3New	6.7500	2.75379	4
T3Familiar	9.2500	.95743	4

Multivariate Tests<sup>b</sup>

Effect		Value	F	Hypothesis df	Error df	Sig.
Time	Pillai's Trace			2.000	2.000	.081
	Wilks' Lambda			2.000	2.000	.081
	Hotelling's Trace			2.000	2.000	.081
	Roy's Largest Root			2.000	2.000	.081
Words	Pillai's Trace	.650	5.571 <sup>a</sup>	1.000	3.000	.099
	Wilks' Lambda	.350	5.571 <sup>a</sup>	1.000	3.000	.099
	Hotelling's Trace	1.857	5.571 <sup>a</sup>	1.000	3.000	.099
	Roy's Largest Root	1.857	5.571 <sup>a</sup>	1.000	3.000	.099
Time * Words	Pillai's Trace	.374	.598 <sup>a</sup>	2.000	2.000	.626
	Wilks' Lambda	.626	.598 <sup>a</sup>	2.000	2.000	.626
	Hotelling's Trace	.598	.598 <sup>a</sup>	2.000	2.000	.626
	Roy's Largest Root	.598	.598 <sup>a</sup>	2.000	2.000	.626

a. Exact statistic

b.

Design: Intercept

Within Subjects Design: Time+Words+Time\*Words

**Mauchly's Test of Sphericity<sup>b</sup>**

Measure: Accuracy

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon <sup>a</sup>		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Time	.787	.480	2	.787	.824	1.000	.500
Words	1.000	.000	0	.	1.000	1.000	1.000
Time * Words	.877	.263	2	.877	.890	1.000	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b.

Design: Intercept

Within Subjects Design: Time+Words+Time\*Words

**Tests of Within-Subjects Effects**

Measure: Accuracy

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Time	Sphericity Assumed	64.000	2	32.000	9.600	.013
	Greenhouse-Geisser	64.000	1.648	38.827	9.600	.022
	Huynh-Feldt	64.000	2.000	32.000	9.600	.013
	Lower-bound	64.000	1.000	64.000	9.600	.053
Error(Time)	Sphericity Assumed	20.000	6	3.333		
	Greenhouse-Geisser	20.000	4.945	4.044		
	Huynh-Feldt	20.000	6.000	3.333		
	Lower-bound	20.000	3.000	6.667		
Words	Sphericity Assumed	28.167	1	28.167	5.571	.099
	Greenhouse-Geisser	28.167	1.000	28.167	5.571	.099
	Huynh-Feldt	28.167	1.000	28.167	5.571	.099
	Lower-bound	28.167	1.000	28.167	5.571	.099
Error(Words)	Sphericity Assumed	15.167	3	5.056		
	Greenhouse-Geisser	15.167	3.000	5.056		
	Huynh-Feldt	15.167	3.000	5.056		
	Lower-bound	15.167	3.000	5.056		
Time * Words	Sphericity Assumed	4.333	2	2.167	.582	.587
	Greenhouse-Geisser	4.333	1.781	2.434	.582	.572
	Huynh-Feldt	4.333	2.000	2.167	.582	.587
	Lower-bound	4.333	1.000	4.333	.582	.501
Error(Time*Words)	Sphericity Assumed	22.333	6	3.722		
	Greenhouse-Geisser	22.333	5.342	4.181		
	Huynh-Feldt	22.333	6.000	3.722		
	Lower-bound	22.333	3.000	7.444		

**Tests of Between-Subjects Effects**

Measure: Accuracy

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	864.000	1	864.000	648.000	.000
Error	4.000	3	1.333		