

Example of Multiple-group ldf – with Follow-up Analyses

In this example, three sections of a research methods class were conducted using three different formats for test preparation. Group 1 was a “control group” that received the lectures, and took the exams; Group 2 received a steady stream of homework assignments, which were similar to items which appeared on the exams; Group 3 received no homework assignments, but did “exam preps” that was similar to items which appeared on the exam. There were four “DVs” for this analysis: scores from the quizzes, Midterm Exam #1, Midterm Exam 2, and the Final (cumulative) Exam.

Group Statistics

GROUP		Mean	Std. Deviation	Valid N (listwise)	
				Unweighted	Weighted
lecture	QUIZ	518.8628	108.77367	20	20.000
	EXAM1	43.6497	9.23430	20	20.000
	EXAM2	39.6246	10.00930	20	20.000
	FINAL	94.4252	8.10272	20	20.000
homework	QUIZ	594.3515	71.29752	20	20.000
	EXAM1	50.9138	8.81464	20	20.000
	EXAM2	49.5690	9.64761	20	20.000
	FINAL	99.4550	6.23406	20	20.000
examprep	QUIZ	472.3838	133.61485	20	20.000
	EXAM1	59.6089	7.27711	20	20.000
	EXAM2	52.9495	11.57586	20	20.000
	FINAL	130.6873	6.76939	20	20.000
Total	QUIZ	528.5327	117.32600	60	60.000
	EXAM1	51.3908	10.62168	60	60.000
	EXAM2	47.3810	11.74384	60	60.000
	FINAL	108.1892	17.60895	60	60.000

Tests of Equality of Group Means

	Wilks' Lambda	F	df1	df2	Sig.
QUIZ	.813	6.539	2	57	.003
EXAM1	.616	17.741	2	57	.000
EXAM2	.764	8.796	2	57	.000
FINAL	.156	154.028	2	57	.000

Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	7.110 ^a	96.0	96.0	.936
2	.295 ^a	4.0	100.0	.477

a. First 2 canonical discriminant functions were used in the analysis.

Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	.095	130.514	8	.000
2	.772	14.348	3	.002

Structure Matrix

	Function	
	1	2
FINAL	.869*	-.338
QUIZ	-.116	.673*
EXAM2	.173	.572*
EXAM1	.286	.380*

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions. Variables ordered by absolute size of correlation within function.

*. Largest absolute correlation between each variable and any discriminant function

Functions at Group Centroids

GROUP	Function	
	1	2
lecture	-2.454	-.557
homework	-1.143	.712
examprep	3.597	-.154

Unstandardized canonical discriminant functions evaluated at group means

Classification Results^a

Original	Count	GROUP	Predicted Group Membership			Total
			lecture	homework	examprep	
		lecture	17	3	0	20
		homework	6	14	0	20
		examprep	0	0	20	20
%		lecture	85.0	15.0	.0	100.0
		homework	30.0	70.0	.0	100.0
		examprep	.0	.0	100.0	100.0

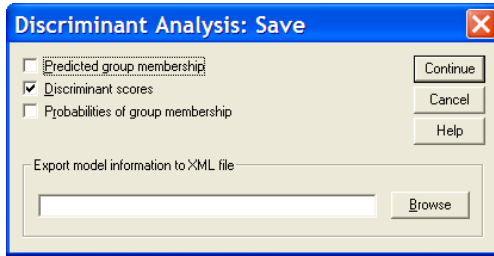
a. 85.0% of original grouped cases correctly classified.

So, we have two ldfs, that seem to do a pretty good job of discriminating between the groups.

- However, much like a k-group ANOVA or a Factorial ANOVA, we know there's a pattern of group differences here, but we don't know which groups are different from which groups – not all the groups need be significantly different from each other!.
- Also, if we have a diffuse structure, we don't know which groups are different on which ldf – not all groups need be significantly different from each other on every ldf!

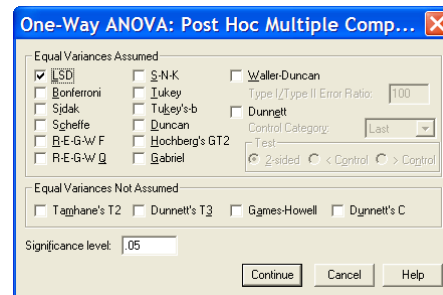
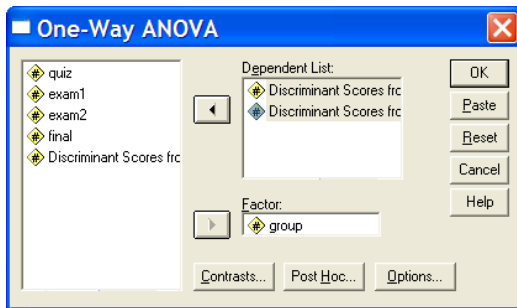
Pairwise Idf Follow-ups:

When getting the Idf analysis click the “Save” button and check “Discriminant scores”



This approach is an obvious extension of the descriptive procedures we were using earlier. It emphasizes the Idfs that were identified and interpreted, and gives statistical information about which groups can be discriminated based on each Idf. Remember, larger $F \approx$ less overlap \approx better classification.

Then use oneway to get pairwise comparisons using **these Idf scores as the DVs**.



ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Discriminant Scores from Function 1 for Analysis 1	Between Groups	405.263	2	202.632	202.632	.000
	Within Groups	57.000	57	1.000		
	Total	462.263	59			
Discriminant Scores from Function 2 for Analysis 1	Between Groups	16.815	2	8.408	8.408	.001
	Within Groups	57.000	57	1.000		
	Total	73.815	59			

Multiple Comparisons

LSD

Dependent Variable	(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Discriminant Scores from Function 1 for Analysis 1	lecture	homework	-1.3107532*	.31622777	.000	-1.9439883	-.6775180
		examprep	-6.0503915*	.31622777	.000	-6.6836267	-5.4171563
	homework	lecture	1.3107532*	.31622777	.000	.6775180	1.9439883
		examprep	-4.7396383*	.31622777	.000	-5.3728735	-4.1064031
	examprep	lecture	6.0503915*	.31622777	.000	5.4171563	6.6836267
		homework	4.7396383*	.31622777	.000	4.1064031	5.3728735
Discriminant Scores from Function 2 for Analysis 1	lecture	homework	-1.2689528*	.31622777	.000	-1.9021880	-.6357176
		examprep	-.4032513	.31622777	.207	-1.0364865	.2299839
	homework	lecture	1.2689528*	.31622777	.000	.6357176	1.9021880
		examprep	.8657015*	.31622777	.008	.2324663	1.4989367
	examprep	lecture	.4032513	.31622777	.207	-.2299839	1.0364865
		homework	-.8657015*	.31622777	.008	-1.4989367	-.2324663

*. The mean difference is significant at the .05 level.

We can see that we all three groups are significantly different from each other on LDF#1 – even though Lecture and Homework have relatively closer centroids and they account for most of the confusions in the reclassification table.

LDF#2 separates Homework from the other two but does not separate Lecture from Examprep.