

Example of another 3-group Discriminant Analysis -- Diffuse Structure

In yet another hypothetical therapy outcome study, patients receiving therapy for depression who had withdrawn from treatment, completed individual therapy or completed group therapy (treat 1,2 & 3) were evaluated by a blind panel of therapists. The DVs were "wellness", depression change, anxiety change, social skills change, and social ease change. There were 20 patients in each group.

Analyze → Classify → Discriminant

Group Statistics

GROUP		Mean	Std. Deviation	Valid N (listwise)	
				Unweighted	Weighted
withdrew	change in overall psychological wellness score	6.5357	2.21309	29	29.000
	change in depression score	2.1328	1.63804	29	29.000
	ANXCHNG	2.0187	.90275	29	29.000
	SSKCHNG	3.5479	1.53151	29	29.000
	SEACHNG	2.1410	1.11972	29	29.000
individual	change in overall psychological wellness score	13.5359	2.04570	29	29.000
	change in depression score	5.6736	2.49986	29	29.000
	ANXCHNG	2.8603	1.32784	29	29.000
	SSKCHNG	3.7440	1.30371	29	29.000
	SEACHNG	2.8989	1.16675	29	29.000
group	change in overall psychological wellness score	14.3179	2.33860	33	33.000
	change in depression score	3.9531	2.02542	33	33.000
	ANXCHNG	3.4413	1.66290	33	33.000
	SSKCHNG	8.0416	1.16890	33	33.000
	SEACHNG	7.5105	1.73491	33	33.000
Total	change in overall psychological wellness score	11.5886	4.11709	91	91.000
	change in depression score	3.9213	2.50162	91	91.000
	ANXCHNG	2.8028	1.46079	91	91.000
	SSKCHNG	5.2400	2.50317	91	91.000
	SEACHNG	4.3297	2.79229	91	91.000

Once again, let's consider the bivariate results before moving on the multivariate analysis. Each of the outcome variables has significant mean differences across the groups. But, there's more...

Look at wellness, depchange and anxchang – you should notice that they show about the same pattern across groups:

→ withdrew < indiv = group

Now, look at sskchange & seaschn, which show a different pattern

→ withdrew = indiv < group

When subgroups of DVs show different patterns of mean differences across groups, we expect to find that there is a diffuse multivariate structure – with different discriminating variables contributing to different between-group distinctions.

Tests of Equality of Group Means

	Wilks' Lambda	F	df1	df2	Sig.
change in overall psychological wellness score	.281	112.347	2	88	.000
change in depression score	.677	20.979	2	88	.000
ANXCHNG	.837	8.592	2	88	.000
SSKCHNG	.278	114.056	2	88	.000
SEACHNG	.242	138.115	2	88	.000

On to the multivariate analyses...

Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	7.934 ^a	82.0	82.0	.642
2	1.744 ^a	18.0	100.0	.397

Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	.041	275.137	10	.000
2	.364	86.808	4	.000

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

Here we have two significant ldfs – a diffuse structure as we anticipated from the group's mean profiles. The "% of variance" values tell us that the first ldf does the bulk of the discrimination, but the second has a significant, substantial and relatively non-trivial contribution. We will also want to check below whether the second ldf provides for discriminations between any pairs of groups that the first ldf doesn't.

So, we know the model "works" with two contributing ldfs and the R_c^2 values of the two ldf tell us "how well" the model works. Now we need to "interpret" each ldf, by looking at what variables correlate with it and contribute to it.

Structure Matrix

	Function	
	1	2
SEACHNG	.626*	-.126
SSKCHNG	.562*	-.221
ANXCHNG	.145*	.127
change in overall psychological wellness score	.428	.794*
change in depression score	.057	.508*

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

Standardized Canonical Discriminant Function Coefficients

	Function	
	1	2
change in overall psychological wellness score	.322	.797
change in depression score	-.050	.456
ANXCHNG	.108	.114
SSKCHNG	.678	-.402
SEACHNG	.748	-.252

1st discriminant – sskchng, seaschnng & wellness -- we might label this “social outcomes”

2nd discriminant -- wellness & depchnng -- we might label this “clinical symptomology”

Some things to notice:

Although anxiety change has a significant bivariate group difference, it wasn't part of either ldf

Wellness change “is part of” both ldfs. This can happen because “different aspects” of the variable may relate/contribute to each ldf. Notice the structure weight of wellness on the first ldf. This means that only .428² or 18% of this variable is related to the first ldf, leaving 82% of that variable to potentially contribute to the second ldf. In this case, .794² = .63” did. When this happens it can inform us both about the identity of the ldf (think about “what part” of wellness relates to the other elements of the 1st vs. the 2nd ldf) as well as of the predictor (what does it mean that our measure of wellness “splits” into a symptomology and a social outcome “part”?)

Here's a graphic for this solution and a look at the reclassification table – both show good pairwise discrimination.

Classification Results

Original	Count	GROUP	Predicted Group Membership			Total
			withdrew	individual	group	
		withdrew	28	1	0	29
		individual	1	28	0	29
		group	0	0	33	33
%		withdrew	96.6	3.4	.0	100.0
		individual	3.4	96.6	.0	100.0
		group	.0	.0	100.0	100.0

a. 97.8% of original grouped cases correctly classified.

more wellness change
more depression change

indiv

less social ease change
less social skills change
less wellness change

-3

more social ease change
more social skills change
more wellness change

group

Functions at Group Centroids

GROUP	Function	
	1	2
withdrew	-2.795	-1.374
individual	-1.283	1.801
group	3.584	-.375

Unstandardized canonical discriminant functions evaluated at group means

-2

less wellness change
less depression change