

Test of Distinguishability Using Multilevel Modeling

(Material in this handout is not in Kenny, Kashy, and Cook, 2006)

Advantages of Treating Dyad Members as Indistinguishable

- Simpler model with fewer parameters
- More power in tests of actor and partner effects

Disadvantages of Treating Dyad Members as Indistinguishable

- If distinguishability makes a difference, then the model is wrong.
- Sometimes the focus is on distinguishing variable and it is lost.
- Some editors or reviewer will not allow you to do it.

Two Runs

Distinguishable (either interaction or two-intercept, results are the same)

- Different Actor and Partner Effects
- Main Effect of Distinguishing Factor
- Heterogeneity of Variance (CSH)

Indistinguishable (4 fewer parameters)

- Same Actor and Partner Effects
- No Main Effect of Distinguishing Factor
- Homogeneity of Variance (CSR)

Run using ML, not REML

Note the number of parameters

There should be 4 more than for the distinguishable run.

Note the -2LogLikelihood (deviance)

Subtract the deviances and number of parameters to get a χ^2 with 4df

If χ^2 is not significant, then the data are consistent with the null hypothesis that the dyad members are indistinguishable. If however, χ^2 is significant, then the data are inconsistent with the null hypothesis that the dyad members are indistinguishable (i.e., dyad members are distinguishable in some way).

Example

Dyad Members Indistinguishable:

- Note that METHOD = ML and COVTYPE(CSR) is used

```
MIXED Satisfaction_A WITH OtherPos_A OtherPos_P  
/FIXED=OtherPos_A OtherPos_P  
/METHOD=ML  
/PRINT=SOLUTION TESTCOV  
/REPEATED=partnum | SUBJECT(CoupleID) COVTYPE(CSR).
```

Model Dimension^a

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	OtherPos_A	1		1		
	OtherPos_P	1		1		
Repeated Effects	Partnum	2	Correlation Compound Symmetry	2	CoupleID	148
Total		5		5		

a. Dependent Variable: Satisfaction_A.

Note that the number of parameters is 5.

Information Criteria^a

-2 Log Likelihood	282.884
Akaike's Information Criterion (AIC)	292.884
Hurvich and Tsai's Criterion (AICC)	293.091
Bozdogan's Criterion (CAIC)	316.336
Schwarz's Bayesian Criterion (BIC)	311.336

Note that the deviance is 282.884.

The information criteria are displayed in smaller-is-better forms.

If done with SEM (see pages 168-169 in KKC), two additional parameters set equal:
 means of X
 variances of X

Test of distinguishability then has 6 degrees of freedom within SEM.

Dyad Members Distinguishable:

- Interaction Approach – Results the same as two-intercept approach
- Note that METHOD = ML but now COVTYPE(CSH) is used
- The main effect of the distinguishing variable is included, as well as it's interaction with the actor and partner variables

MIXED

Satisfaction_A WITH OtherPos_A OtherPos_P Gender_A
 /FIXED = OtherPos_A OtherPos_P Gender_A Gender_A*OtherPos_A Gender_A*OtherPos_P
 /METHOD=**ML**
 /PRINT = SOLUTION TESTCOV
 /REPEATED = Gender_A | SUBJECT(coupleid) COVTYPE(CSH) .

Model Dimension^a

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	OtherPos_A	1		1		
	OtherPos_P	1		1		
	Gender_A	1		1		
	OtherPos_A * Gender_A	1		1		
	OtherPos_P * Gender_A	1		1		
Repeated Effects	Gender_A	2	Heterogeneous Compound Symmetry	3	CoupleID	148
Total		8		9		

a. Dependent Variable: Satisfaction_A.

Note that the number of parameters is 9.

-2 Log Likelihood	275.607
Akaike's Information Criterion (AIC)	293.607
Hurvich and Tsai's Criterion (AICC)	294.236
Bozdogan's Criterion (CAIC)	335.820
Schwarz's Bayesian Criterion (BIC)	326.820

Note that the deviance is now 275.607.

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: Satisfaction_A.

χ^2 (distinguishable parameters – indistinguishable parameters)

= indistinguishable deviance – distinguishable deviance

= $\chi^2(9 - 5) = 282.884 - 275.607 = 7.277, p = .122$

The null hypothesis is that the dyads are indistinguishable. We cannot reject the null hypothesis, so we conclude that there is no empirical evidence that dyad members should be differentiated by their gender.