Dingy Output

Tests of Distinguishability and Nonindependence
August 22, 2018

1. Text

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Tests of Distinguishability

The focus of this analysis is to determine whether role makes a statistical difference in the data, and if it does, what is that difference. That is, are there differences between the Father and the Child for the mixed variables Relation quality? There are 82 dyads in the sample and no missing data. The analyses employ the method of structural equation modeling using the computer program lavaan. The means and standard deviations of each variable for both the Father and the Child are presented in Table 1. Note that the estimates are maximum likelihood estimates and so the standard deviations are a bit larger than conventional estimates.

There are two ways in which role can make a difference. They are differences between the variables in their means and their variances. That is, are there mean or variance differences between the Father and the Child for the mixed variable Relation quality? For instance, the means and variances of Relation quality might differ for the Father and the Child. Because there is just one mixed variable and no between- or within-dyads variables, there are no correlations that can differ for the Father and the Child .

Dingy estimates several models and compares their fit to determine the best fitting model. To compare models, Dingy uses the chi square test, the chi square difference test, the Root Mean Square Error of Approximation or RMSEA, and the Sample Size Adjusted Bayesian Information Criterion or SABIC. With large sample sizes, the chi square tests have so much power that they are almost always statistically significant. Because the sample size for this analysis would not be considered large, the chi square tests may be informative. Here the RMSEA must be less than 0.08 to be considered a good-fitting model. The SABIC is a "badness of fit" index with smaller values indicating better fit. Its absolute value is not interpretable, but values for different models can be compared. One advantage of the SABIC is that a value can be computed for the model of full distinguishability even though it is a saturated model with zero degrees of freedom. To learn more about these measures of fit, go to davidakenny.net/cm/fit.htm (reverse the slashes).

Table 2 provides the measures of fit for three models which allow for different types of distinguishability and Table 3 presents the tests of hypotheses of equal means and variances. To begin, the test that the means for each variable are equal (Model I versus Model II) is statistically significant (chi-square(1) = 9.20, p = .002). Thus, there is evidence that the means are unequal. The test that the variances (Model II versus Model III) are equal is not statistically significant (chi-square(1) = 0.71, p = .401). Thus, the data are consistent with the hypothesis that the variances are equal.

Test of Nonindependence

Additionally, there is the question of whether the scores of the Father and the Child are correlated, i.e., nonindependent. There is one correlation between the scores of the Father and the Child, and the null hypothesis is that this correlation is zero. Table 4 contains the results from these tests. (Note that SABIC(Sat) refers to the SABIC for the saturated model.) Treating dyad members as distinguishable, there is good evidence that there is nonindependence or correlation between the scores of the Father and the Child. Alternatively, if we treat dyad members as indistinguishable, there is good evidence that there is nonindependence or correlation between the scores of the Father and the Child.

2. Tables

Table 1: Descriptive Statistics for the Father and the Child

	Member Father		Child	
	Mean	SD	Mean	SD
Relation quality	4.957	0.884	4.624	0.810

Table 2: Tests of Different Types of Distinguishability

Model	Equal Means	Equal Variances	chi square	df	p	RMSEA	SABIC
I	Yes	Yes	9.907	2	.007	0.220	13.665
II	No	Yes	0.705	1	.401	0.000	5.716
III	No	No	0				6.264

Table 3: Tests of Hypotheses of Different Types of Distinguishability

	Test	chi square	df	p value
Means	I versus II	9.202	1	.002
Variances	II versus III	0.705	1	.401

Table 4: Tests of Nonindependence across the Father and the Child

	chi square	df	p value	RMSEA	SABIC	SABIC(Sat)
Distinguishable	10.742	1	.001	0.345	15.753	6.264
Indistinguishable	7.673	1	.006	0.285	10.179	3.758

3. lavaan Output

Test of Distinguishability or the I-SAT Model

lavaan (0.5-23.1097) converged normally after 11 iterations

Number of observations	82
Number of missing patterns	1

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  Estimator                                         ML
  Minimum Function Test Statistic                9.907
  Degrees of freedom                                 2
  P-value (Chi-square)                           0.007
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```
      lhs op     rhs label   est    se      z pvalue ci.lower ci.upper
1 PWB_A_2 ~1            m1 4.791 0.077 62.305   0.00    4.640    4.941
2 PWB_A_1 ~1            m1 4.791 0.077 62.305   0.00    4.640    4.941
3 PWB_A_2 ~~ PWB_A_2    v1 0.746 0.086  8.676   0.00    0.578    0.915
4 PWB_A_1 ~~ PWB_A_1    v1 0.746 0.086  8.676   0.00    0.578    0.915
5 PWB_A_2 ~~ PWB_A_1       0.223 0.086  2.593   0.01    0.054    0.392
  std.lv std.all
1  4.791   5.545
2  4.791   5.545
3  0.746   1.000
4  0.746   1.000
5  0.223   0.299
```