# Dingy Output

*Tests of Distinguishability and Nonindependence*   
*August 20, 2018*

# 1. Text

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text for accuracy. If you do find an error, please report it to David A.   
Kenny.  
  
 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 Mother and the Child for the mixed   
variables REL\_QUAL? 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 Mother 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 Mother and the Child   
for the mixed variable REL\_QUAL? For instance, the means and variances of   
REL\_QUAL might differ for the Mother 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 Mother 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) = 7.01, p = .008). 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) = 0.08, p =   
.783). 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 Mother   
and the Child are correlated, i.e., nonindependent. There is one correlation   
between the scores of the Mother 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 Mother 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 Mother and the Child.

# 2. Tables

Table 1: Descriptive Statistics for the Mother and the Child

Member Mother Child   
 Mean SD Mean SD  
REL\_QUAL 4.768 0.824 5.037 0.801

Table 2: Tests of Different Types of Distinguishability

Model Equal Means Equal Variances chi square df p RMSEA SABIC  
 I Yes Yes 7.090 2 .029 0.176 10.848  
 II No Yes 0.076 1 .783 0.000 5.087  
 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 7.014 1 .008  
Variances II versus III 0.076 1 .783

Table 4: Tests of Nonindependence across the Mother and the Child  
   
 chi square df p value RMSEA SABIC SABIC(Sat)  
 Distinguishable 13.549 1 <.001 0.391 18.561 6.264  
Indistinguishable 10.930 1 <.001 0.348 13.436 3.758

# 3. lavaan Output

Test of Distinguishability or the I-SAT Model

lavaan (0.5-23.1097) converged normally after 13 iterations  
  
 Number of observations 82  
  
 Number of missing patterns 1  
  
 Estimator ML  
 Minimum Function Test Statistic 7.090  
 Degrees of freedom 2  
 P-value (Chi-square) 0.029

lhs op rhs label est se z pvalue ci.lower ci.upper  
1 EWB\_C\_1 ~1 m1 4.902 0.075 65.503 0.000 4.756 5.049  
2 EWB\_M\_1 ~1 m1 4.902 0.075 65.503 0.000 4.756 5.049  
3 EWB\_C\_1 ~~ EWB\_C\_1 v1 0.679 0.080 8.538 0.000 0.523 0.835  
4 EWB\_M\_1 ~~ EWB\_M\_1 v1 0.679 0.080 8.538 0.000 0.523 0.835  
5 EWB\_C\_1 ~~ EWB\_M\_1 0.240 0.080 3.016 0.003 0.084 0.396  
 std.lv std.all  
1 4.902 5.950  
2 4.902 5.950  
3 0.679 1.000  
4 0.679 1.000  
5 0.240 0.353