# Dingy Output

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

# 1. Text

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please make sure that you acknowledge that you have used this program. Also
should you decide to use the exact text included here, you will need to put
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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