Dingy Output

Tests of Distinguishability and Nonindependence
May 19, 2016

1. Text

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Tests of Distinguishability

The focus is to determine whether Gender makes a statistical difference in the data, and if it does, what is that difference. That is, are there differences between Wife and Husband for the mixed variables Self Positivity, Other Postivity, Tension, Satisfaction, and Similar Hobbies and the between-dyads variable Years Married? There are 148 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 Wife and Husband 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 three ways in which Gender can make a difference. They are differences between the variables in their means, in their variances, and differences between correlations between the two variables. To test if correlations differ, the variances must be set equal for the two members. Note too that the correlations may differ, but cross-variable effects (e.g., actor and partner effects in the Actor-Partner Interdependence Model) might not differ. For instance, the means and variances of Self Positivity might differ for Wife and Husband. For correlation, an example is that the correlations between Self Positivity and Other Postivity might be different for Wife and Husband. Another example is that the correlations between Self Positivity and Years Married might be different for Wife and Husband.

Dingy estimates several models and compares them to determine the best fitting model. To compare models, Dingy uses the chi square test, the chi square difference, 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 informative. With Dingy, 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 five models which allow for different types of distinguishability and Table 3 is a table of the tests of hypotheses of equal means, variances, and correlations. To begin, the test that the means for each variable are equal

(Model I versus Model II) is statistically significant (chi-square(5) = 46.85, p < .001). Thus, there is evidence that the means are unequal. Next, the test of whether the correlations between pairs of variables are equal (Model I versus Model III) is not statistically significant (chi-square(25) = 23.62, p = .541). Thus, the data are consistent with the hypothesis that the correlations are equal, given that the variances are equal. Lastly, the test that the variances are equal (Model IV versus Model V) is not statistically significant (chi-square(5) = 10.34, p = .066). Thus, the data are consistent with the hypothesis that the variances are equal. In terms of chi square tests, the Means Unequal Model or Model II is the best fitting model. In terms of fit indices, the Means Unequal Model or Model II appears to be the best model as it has the lowest value of the RMSEA and the SABIC.

The model of complete indistinguishability is called the I-Sat model by Olsen and Kenny (2006) and that model has a chi square of 80.800 with 35 degrees of freedom. The null model for the indistinguishable case (the model that fixes all correlations to zero, but frees the means and variances and sets them equal across the two members) is 457.624 with 65 degrees of freedom.

Test of Nonindependence

Additionally, the question is whether the scores of the Wife and the Husband are correlated, i.e., nonindependent. There are 25 correlations between the scores of the Wife and the Husband, and the null hypothesis is that these correlations are all zero. The effects due to the between-dyads variables have been removed in tests of nonindependence. 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 Wife and Husband. Alternatively, if we treat dyad members as indistinguishable, there is good evidence that there is nonindependence or correlation between the scores of Wife and Husband.

2. Tables

Table 1: Descriptive Statistics for Wife and Husband

Person	Wife		Husband	
	Mean	SD	Mean	SD
Self Positivity	4.291	0.408	4.082	0.389
Other Postivity	4.246	0.521	4.281	0.472
Tension	2.520	0.707	2.341	0.653
Satisfaction	3.591	0.528	3.618	0.460
Similar Hobbies	0.189	0.585	-0.034	0.682
Years Married	-0.000	7.694	-0.000	7.694

Table 2: Tests of Different Types of Distinguishability

Model	Equal Means	Equal Variances	Equal Correlations	chi square	df	p	RMSEA	SABIC
I	Yes	Yes	Yes	80.800	35	<.001	0.094	157.768
II	No	Yes	Yes	33.952	30	.283	0.030	120.083
III	Yes	Yes	No	57.176	10	<.001	0.179	179.959
IV	No	Yes	No	10.344	5	.066	0.085	142.290
V	No	No	No		0			141.109

Table 3: Tests of Hypotheses of Different Types of Distinguishability

	Test	chi square	df	p value
Means	I versus II	46.848	5	<.001
Correlations	I versus III	23.624	25	.541
Variances	IV versus V	10.344	5	.066

Table 4: Tests of Nonindependence across Wife and Husband

	chi square	df	p value	RMSEA	SABIC	SABIC(Sat)
Distinguishable	122.044	25	<.001	0.162	217.338	141.109
Indistinguishable	106.455	15	<.001	0.203	155.935	76.968

3. lavaan Output

Test of Distinguishability or the I-SAT Model

lavaan (0.5-16) converged normally after 116 iterations

Number of observations	148
Number of missing patterns	1
Estimator	ML
Minimum Function Test Statistic	80.800
Degrees of freedom	35
P-value (Chi-square)	0.000

	lhs	op	rhs	label	est	se	z	pvalue
1	SelfPos_H	~1		m1	4.186	0.025	168.056	0.000
2	SelfPos_W	~1		m1	4.186	0.025	168.056	0.000
3	SelfPos_H	~~	SelfPos_H	v1	0.170	0.014	12.123	0.000
4	SelfPos_W	~~	SelfPos_W	v1	0.170	0.014	12.123	0.000
5	SelfPos_H	~~	SelfPos_W		0.014	0.014	1.011	0.312
6	OtherPos_H	~1		m2	4.264	0.032	132.841	0.000
7	OtherPos_W	~1		m2	4.264	0.032	132.841	0.000
8	OtherPos_H	~~	OtherPos_H	v2	0.248	0.021	11.852	0.000
9	OtherPos_W	~~	OtherPos_W	v2	0.248	0.021	11.852	0.000
10	OtherPos_H	~~	OtherPos_W		0.057	0.021	2.744	0.006
11	Tension_H	~1		m3	2.431	0.046	53.127	0.000
12	Tension_W	~1		m3	2.431	0.046	53.127	0.000
13	Tension_H	~~	Tension_H	v3	0.471	0.041	11.599	0.000
14	Tension_W	~~	Tension_W	v3	0.471	0.041	11.599	0.000
15	Tension_H	~~	Tension_W		0.149	0.041	3.670	0.000
16	Satisfaction_H	~1		m4	3.605	0.037	98.431	0.000
17	Satisfaction_W	~1		m4	3.605	0.037	98.431	0.000
18	Satisfaction_H	~~	Satisfaction_H	v4	0.246	0.024	10.356	0.000

19	Satisfaction_W	~~	Satisfaction_W	v4	0.246	0.024	10.356	0.000
20	Satisfaction_H	~~	Satisfaction_W		0.151	0.024	6.383	0.000
21	SimHob_H	~1		m5	0.078	0.042	1.833	0.067
22	SimHob_W	~1		m5	0.078	0.042	1.833	0.067
23	SimHob_H	~~	SimHob_H	v5	0.416	0.036	11.722	0.000
24	SimHob_W	~~	SimHob_W	v5	0.416	0.036	11.722	0.000
25	SimHob_H	~~	SimHob_W		0.116	0.036	3.255	0.001
26	SelfPos_W	~~	OtherPos_H	c12	0.050	0.013	3.898	0.000
27	SelfPos_H	~~	OtherPos_W	c12	0.050	0.013	3.898	0.000
28	SelfPos_W	~~	OtherPos_W	p12	0.050	0.013	3.951	0.000
29	SelfPos_H	~~	OtherPos_H	p12	0.050	0.013	3.951	0.000
30	SelfPos_W	~~	Tension_H	c13	-0.030	0.017	-1.764	0.078
31	SelfPos_H	~~	Tension_W	c13	-0.030	0.017	-1.764	0.078
32	SelfPos_W	~~	Tension_W	p13	-0.029	0.017	-1.744	0.081
33	SelfPos_H	~~	Tension_H	p13	-0.029	0.017	-1.744	0.081
34	SelfPos_W	~~	Satisfaction_H	c14	0.012	0.012	0.997	0.319
35	SelfPos_H	~~	Satisfaction_W	c14	0.012	0.012	0.997	0.319
36	SelfPos_W	~~	Satisfaction_W	p14	0.037	0.012	3.009	0.003
37	SelfPos_H	~~	Satisfaction_H	p14	0.037	0.012	3.009	0.003
38	SelfPos_W	~~	SimHob_H	c15	0.001	0.016	0.067	0.946
39	SelfPos_H	~~	SimHob_W	c15	0.001	0.016	0.067	0.946
40	SelfPos_W	~~	SimHob_W	p15	0.016	0.016	1.017	0.309
41	SelfPos_H	~~	SimHob_H	p15	0.016	0.016	1.017	0.309
42	OtherPos_W	~~	Tension_H	c23	-0.093	0.022	-4.119	0.000
43	OtherPos_H	~~	Tension_W	c23	-0.093	0.022	-4.119	0.000
44	OtherPos_W	~~	Tension_W	p23	-0.126	0.022	-5.593	0.000
45	OtherPos_H	~~	Tension_H	p23	-0.126	0.022	-5.593	0.000
46	OtherPos_W	~~	Satisfaction_H	c24	0.094	0.018	5.354	0.000
47	OtherPos_H	~~	Satisfaction_W	c24	0.094	0.018	5.354	0.000
48	OtherPos_W	~~	Satisfaction_W	p24	0.116	0.018	6.569	0.000
49	OtherPos_H	~~	Satisfaction_H	p24	0.116	0.018	6.569	0.000
50	OtherPos_W	~~	SimHob_H	c25	0.049	0.020	2.488	0.013
51	OtherPos_H	~~	SimHob_W	c25	0.049	0.020	2.488	0.013
52	OtherPos_W	~~	SimHob_W	p25	0.057	0.020	2.899	0.004
53	OtherPos_H	~~	SimHob_H	p25	0.057	0.020	2.899	0.004
54	Tension_W	~~	Satisfaction_H	c34	-0.139	0.026	-5.380	0.000
55	Tension_H	~~	Satisfaction_W	c34	-0.139	0.026	-5.380	0.000
56	Tension_W	~~	Satisfaction_W	p34	-0.203	0.026	-7.835	0.000
57	Tension_H	~~	Satisfaction_H	p34	-0.203	0.026	-7.835	0.000
58	Tension_W	~~	SimHob_H	c35	-0.042	0.027	-1.545	0.122
59	Tension_H	~~	SimHob_W	c35	-0.042	0.027	-1.545	0.122
60	Tension_W	~~	SimHob_W	p35	-0.054	0.027	-1.981	0.048
61	Tension_H	~~	SimHob_H	p35	-0.054	0.027	-1.981	0.048
62	Satisfaction_W	~~	SimHob_H	c45	0.072	0.021	3.385	0.001
63	Satisfaction_H	~~	SimHob_W	c45	0.072	0.021	3.385	0.001
64	Satisfaction_W	~~	SimHob_W	p45	0.092	0.021	4.313	0.000
65	Satisfaction_H	~~	SimHob_H	p45	0.092	0.021	4.313	0.000
66	yearsmar	~1		mm1	0.000	0.632	0.000	1.000
67	yearsmar	~~	yearsmar	vv1	59.192	6.881	8.602	0.000
68	SelfPos_W	~~	yearsmar	cc11	0.230	0.193	1.192	0.233
69	SelfPos_H	~~	yearsmar	cc11	0.230	0.193	1.192	0.233
70	OtherPos_W	~~	yearsmar	cc12	0.506	0.250	2.020	0.043
71	OtherPos_H	~~	yearsmar	cc12	0.506	0.250	2.020	0.043
72	Tension_W	~~	yearsmar	cc13	-0.587	0.355	-1.651	0.099

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73      Tension_H ~~       yearsmar  cc13 -0.587 0.355  -1.651  0.099
74 Satisfaction_W ~~       yearsmar  cc14 -0.022 0.282  -0.080  0.936
75 Satisfaction_H ~~       yearsmar  cc14 -0.022 0.282  -0.080  0.936
76       SimHob_W ~~       yearsmar  cc15 -0.465 0.328  -1.416  0.157
77       SimHob_H ~~       yearsmar  cc15 -0.465 0.328  -1.416  0.157
   ci.lower ci.upper std.lv std.all
1     4.138    4.235  4.186  10.167
2     4.138    4.235  4.186  10.167
3     0.142    0.197  0.170   1.000
4     0.142    0.197  0.170   1.000
5    -0.013    0.042  0.014   0.083
6     4.201    4.326  4.264   8.568
7     4.201    4.326  4.264   8.568
8     0.207    0.289  0.248   1.000
9     0.207    0.289  0.248   1.000
10    0.016    0.098  0.057   0.232
11    2.341    2.520  2.431   3.543
12    2.341    2.520  2.431   3.543
13    0.391    0.550  0.471   1.000
14    0.391    0.550  0.471   1.000
15    0.069    0.228  0.149   0.316
16    3.533    3.677  3.605   7.274
17    3.533    3.677  3.605   7.274
18    0.199    0.292  0.246   1.000
19    0.199    0.292  0.246   1.000
20    0.105    0.198  0.151   0.616
21   -0.005    0.161  0.078   0.120
22   -0.005    0.161  0.078   0.120
23    0.347    0.486  0.416   1.000
24    0.347    0.486  0.416   1.000
25    0.046    0.185  0.116   0.278
26    0.025    0.074  0.050   0.242
27    0.025    0.074  0.050   0.242
28    0.025    0.075  0.050   0.245
29    0.025    0.075  0.050   0.245
30   -0.063    0.003 -0.030  -0.105
31   -0.063    0.003 -0.030  -0.105
32   -0.062    0.004 -0.029  -0.104
33   -0.062    0.004 -0.029  -0.104
34   -0.012    0.037  0.012   0.060
35   -0.012    0.037  0.012   0.060
36    0.013    0.061  0.037   0.182
37    0.013    0.061  0.037   0.182
38   -0.030    0.032  0.001   0.004
39   -0.030    0.032  0.001   0.004
40   -0.015    0.047  0.016   0.060
41   -0.015    0.047  0.016   0.060
42   -0.137   -0.049 -0.093  -0.271
43   -0.137   -0.049 -0.093  -0.271
44   -0.170   -0.082 -0.126  -0.368
45   -0.170   -0.082 -0.126  -0.368
46    0.060    0.129  0.094   0.382
47    0.060    0.129  0.094   0.382
48    0.081    0.150  0.116   0.469
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49	0.081	0.150	0.116	0.469
50	0.010	0.088	0.049	0.153
51	0.010	0.088	0.049	0.153
52	0.019	0.096	0.057	0.178
53	0.019	0.096	0.057	0.178
54	-0.190	-0.089	-0.139	-0.410
55	-0.190	-0.089	-0.139	-0.410
56	-0.254	-0.152	-0.203	-0.597
57	-0.254	-0.152	-0.203	-0.597
58	-0.095	0.011	-0.042	-0.095
59	-0.095	0.011	-0.042	-0.095
60	-0.107	-0.001	-0.054	-0.121
61	-0.107	-0.001	-0.054	-0.121
62	0.030	0.113	0.072	0.225
63	0.030	0.113	0.072	0.225
64	0.050	0.133	0.092	0.286
65	0.050	0.133	0.092	0.286
66	-1.240	1.239	0.000	0.000
67	45.705	72.678	59.192	1.000
68	-0.148	0.607	0.230	0.072
69	-0.148	0.607	0.230	0.072
70	0.015	0.997	0.506	0.132
71	0.015	0.997	0.506	0.132
72	-1.283	0.110	-0.587	-0.111
73	-1.283	0.110	-0.587	-0.111
74	-0.575	0.530	-0.022	-0.006
75	-0.575	0.530	-0.022	-0.006
76	-1.108	0.179	-0.465	-0.094
77	-1.108	0.179	-0.465	-0.094