APIMeM Output

Actor-Partner Interdependence Mediation Model Results
May 25, 2016

1. Text

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<center>Summary of APIM Mediation Results</center>

The focus of this study is the investigation of the mediation of effect of Other Positvity on Satisfaction by Tension within the Actor-Partner Interdependence model. All three variables are mixed variables and so the relationship between any two variables includes actor and partner effects. The total number of dyads is 148, and there are no missing data. The dyad members are treated as if they were indistinguishable. The test of distinguishability which includes six equal actor and partner effects across members, three equal means, and three equal variances is not statistically significant (chi-square(12) = 17.29, p = .139), with an RMSEA of 0.055. The structural equation models are estimated using the program lavaan. The standard errors and confidence intervals for simple, direct, and total effects uses those based on normal theory. However, the standard errors and confidence intervals for the simple and total indirect effects use the Monte Carlo method, also called the parametric bootstrap, with 40000 trials. The descriptive statistics are in Table 1.

For the estimates below to be valid, it must be assumed that there is no measurement error in Other Positvity and Tension. Additionally, it must be assumed that there are no unmeasured common causes (i.e., confounders) between Other Positvity and Tension, between Other Positvity and Satisfaction, and between Tension and Satisfaction. It must be assumed that Satisfaction does not cause Other Positvity or Tension and that Tension does not cause Other Positvity. Finally, it must be assumed that Other Positvity and Tension do not interact to cause Satisfaction.

For combined test the four mediation indirect effects involves fitting two models, one with four indirect effects and one without those effects. This combined test of mediation is statistically significant (chi-square(3) = 45.66, p < .001), with an RMSEA of 0.310. (The test has three degrees of freedom because if any three indirects are zero, the fourth must also be zero.) Because the RMSEA is greater than .10 and the chi square is statistically significant, there is sufficient evidence to believe that there is mediation.

Table 2 presents the effects in the mediational model. The multiple correlation for the Tension equations is .415 and the multiple correlation for the Satisfaction equations is .696. First considered are the effects of Other Positvity on Tension. The actor effect equals −0.445 (p < .001) with a standardized effect of −.323. The partner effect equals −0.271 (p < .001) with a standardized effect of −.196. The ratio of the partner to the actor effect or k is 0.609 with a confidence interval from 0.463 to 0.759. It can be concluded that the model is in between the actor-only (k = 0) and the couple (k = 1) models. Next considered are the

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effects of Tension on Satisfaction. The actor effect equals -0.302 (p < .001) with a standardized effect of -.418. The partner effect equals -0.113 (p < .001) with a standardized effect of -.156. The ratio of the partner to the actor effect or k is 0.373 with a confidence interval from 0.162 to 0.580. It can be concluded that the model is in between the actor-only (k = 0) and the couple (k = 1) models. Lastly considered are the effects of Other Positvity on Satisfaction. The actor effect equals 0.235 (p < .001) with a standardized effect of .236. The partner effect equals 0.156 (p < .001) with a standardized effect of .157.

The four simple indirect, two direct, two total indirect, and two total effects of Other Positvity on Satisfaction are contained in Table 3. Consider first the actor effect from Other Positvity to Satisfaction. The total actor effect equals 0.400 (0.308 to 0.493) with a standardized effect of .402. The direct effect equals 0.235 (confidence interval: 0.148 to 0.323) with a standardized effect of .236 and it explains 58.81 percent of the total effect. There are two indirect effects: The total actor indirect effect equals 0.165 (confidence interval: 0.111 to 0.226) with a standardized effect of .166 and it explains 41.19 percent of the total effect. The actor-actor indirect effect equals 0.134 (confidence interval: 0.080 to 0.198) with a standardized effect of .135 and it explains 33.57 percent of the total effect. The partner-partner indirect effect equals 0.031 (confidence interval: 0.013 to 0.050) with a standardized effect of .031 and it explains 7.62 percent of the total effect. Next considered is the partner effect from Other Positvity to Satisfaction. The total partner effect equals 0.288 (0.196 to 0.380) with a standardized effect of .369. The direct effect equals 0.156 (confidence interval: 0.068 to 0.244) with a standardized effect of .157 and it explains 54.18 percent of the total effect. There are two indirect effects: The total partner indirect effect equals 0.132 (confidence interval: 0.086 to 0.184) with a standardized effect of .132 and it explains 45.82 percent of the total effect. The actor-partner indirect effect equals 0.050 (confidence interval: 0.020 to 0.085) with a standardized effect of .050 and it explains 17.40 percent of the total effect. The partner-partner indirect effect equals 0.082 (confidence interval: 0.049 to 0.121) with a standardized effect of .082 and it explains 28.42 percent of the total effect.

Model with A Prior Values for the k's

The user has requested to estimate a model in which the partner effects are fixed to be equal the actor effects times a constant. That constant or k for the effect from Other Positvity on Tension has been set to 0.500 and that constant or k from Tension on Satisfaction has been set to 0.500. The fit of this model is a chi square with 2 degrees of freedom that equals 1.647 (p = .439). The SABIC for this model is 47.461 and the base model is 49.480. The RMSEA for this model is 0.075. The data appear to be consistent with these values of k.

Table 4 presents the effects in the mediational model with fixed values of k. The multiple correlation for the Tension equations is .411 and the multiple correlation for the Satisfaction equations is .696. (Tests of partner effects may not be very interpretable because because their effects are contrained.) First considered are the effects of Other Positvity on Tension. The actor effect equals -0.465 (p < .001) with a standardized effect of -.337. The partner effect equals -0.233 (p < .001) with a standardized effect of -.169. Next considered are the effects of Tension on Satisfaction. The actor effect equals -0.291 (p < .001) with a standardized effect of -.403. The partner effect equals -0.145 (p < .001) with a standardized effect of -.201. Lastly considered are the effects of Other Positvity on Satisfaction. The actor effect equals 0.232 (p < .001) with a standardized effect of .233. The partner effect equals 0.145 (p < .001) with a standardized effect of .145.

The four simple indirect, two direct, two total indirect, and two total effects of Other Positvity on Satisfaction are contained in Table 5. (Tests of actor-partner, partner-actor,

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and partner-partner indirect effects may not be very interpretable because because partner effects are contrained.) Considered first is the actor effect from Other Positvity to Satisfaction. The total actor effect equals 0.401 (0.308 to 0.493) with a standardized effect of .402. The direct effect equals 0.232 (confidence interval: 0.144 to 0.232) with a standardized effect of .233 and it explains 57.80 percent of the total effect. There are two indirect effects: The total actor indirect effect equals 0.169 (confidence interval: 0.115 to 0.230) with a standardized effect of .170 and it explains 42.20 percent of the total effect. The actor-actor indirect effect equals 0.135 (confidence interval: 0.081 to 0.199) with a standardized effect of .136 and it explains 33.76 percent of the total effect. The partner-partner indirect effect equals 0.034 (confidence interval: 0.017 to 0.052) with a standardized effect of .034 and it explains 8.44 percent of the total effect. Next considered is the partner effect from Other Positvity to Satisfaction. The total partner effect equals 0.280 (0.192 to 0.368) with a standardized effect of .368. The direct effect equals 0.232 (confidence interval: 0.059 to 0.145) with a standardized effect of .145 and it explains 51.65 percent of the total effect. There are two indirect effects: The total partner indirect effect equals 0.135 (confidence interval: 0.089 to 0.188) with a standardized effect of .136 and it explains 48.35 percent of the total effect. The actor-partner indirect effect equals 0.068 (confidence interval: 0.034 to 0.106) with a standardized effect of .068 and it explains 24.18 percent of the total effect. The partner-partner indirect effect equals 0.068 (confidence interval: 0.039 to 0.103) with a standardized effect of .068 and it explains 24.18 percent of the total effect.

2. Tables

Table 1: Descriptive Statistics

Variable	Mean	SD	Minimum	Maximum
Other Positvity	4.264	0.498	2.600	5.000
Satisfaction	3.605	0.496	1.167	4.000
Tension	2.431	0.686	1.167	4.000

Table 2: Effects in the Mediation Model

Cause	Effect	Type	Estimate	p value	Lower 95% CI		Upper	Standardized
Other Positvity	Tension	Actor	-0.445	<.001	-0.589	to	-0.301	-0.323
		Partner	-0.271	<.001	-0.415	to	-0.127	-0.196
Tension	Satisfaction	Actor	-0.302	<.001	-0.366	to	-0.238	-0.418
		Partner	-0.113	<.001	-0.176	to	-0.049	-0.156
Other Positvity	Satisfaction	Actor	0.235	<.001	0.148	to	0.323	0.236
		Partner	0.156	<.001	0.068	to	0.244	0.157

Table 3: Total, Direct, and Indirect Effects

Type	Effect	Estimate	p value	Lower 95% CI		Upper	Standardized	Percent Total
Actor	Total	0.400	<.001	0.308	to	0.493	0.402	
	Direct	0.235	<.001	0.148	to	0.323	0.236	58.81
	Total Indirect	0.165	<.001	0.111	to	0.226	0.166	41.19
	Actor-Actor Indirect	0.134	<.001	0.080	to	0.198	0.135	33.57
	Partner-Partner Indirect	0.031	.012	0.013	to	0.050	0.031	7.62

	Type		Effect	Estimate	p value	Lower 95% CI		Upper	Standardized	Percent Total
Partner			Total	0.288	<.001	0.196	to	0.380	0.289	
			Direct	0.156	<.001	0.068	to	0.244	0.157	54.18
		Total Indirect	0.132	<.001	0.086	to	0.184	0.270	45.82
	Actor-Partner	Indirect	0.050	.003	0.020	to	0.085	0.135	17.40
	Partner-Actor	Indirect	0.082	<.001	0.049	to	0.121	0.135	28.42

Table 4: Effects in the Mediation Model with Fixed k Values

Cause	Effect	Type	Estimate	p value	Lower 95% CI		Upper	Standardized
Other Positvity	Tension	Actor	-0.465	<.001	-0.591	to	-0.339	-0.337
		Partner	-0.233	<.001	-0.296	to	-0.170	-0.169
Tension	Satisfaction	Actor	-0.291	<.001	-0.352	to	-0.230	-0.403
		Partner	-0.145	<.001	-0.176	to	-0.115	-0.201
Other Positvity	Satisfaction	Actor	0.232	<.001	0.144	to	0.319	0.233
		Partner	0.145	<.001	0.059	to	0.230	0.145

Table 5: Total, Direct, and Indirect Effects with Fixed k Values

Type			Effect	Estimate	p value	Lower 95% CI		Upper	Standardized	Percent Total
Actor			Total	0.401	<.001	0.308	to	0.493	0.402	
			Direct	0.232	<.001	0.144	to	0.319	0.233	57.80
		Total Indirect	0.169	<.001	0.115	to	0.230	0.170	42.20
	Actor-Actor	Indirect	0.135	<.001	0.081	to	0.199	0.136	33.76
	Partner-Partner	Indirect	0.034	<.001	0.017	to	0.052	0.034	8.44
Partner			Total	0.280	<.001	0.192	to	0.368	0.281	
			Direct	0.145	<.001	0.059	to	0.230	0.145	51.65
		Total Indirect	0.135	<.001	0.089	to	0.188	0.272	48.35
	Actor-Partner	Indirect	0.068	<.001	0.034	to	0.106	0.136	24.18
	Partner-Actor	Indirect	0.068	<.001	0.039	to	0.103	0.136	24.18

3. lavaan Computer Output

Mediation Run with Indistinguishable Dyads

lavaan (0.5-16) converged normally after 271 iterations

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  Number of observations                          148

  Number of missing patterns                        1

  Estimator                                        ML
  Minimum Function Test Statistic              17.293
  Degrees of freedom                               12
  P-value (Chi-square)                          0.139


        lhs op           rhs     label    est    se       z pvalue
1       mv1  ~           xv1        aa -0.445 0.073  -6.069  0.000
2       mv2  ~           xv2        aa -0.445 0.073  -6.069  0.000
3       mv1  ~           xv2        pa -0.271 0.073  -3.695  0.000
```

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4         mv2  ~              xv1        pa -0.271 0.073   -3.695  0.000
5         yv1  ~              mv1        ab -0.302 0.033   -9.283  0.000
6         yv2  ~              mv2        ab -0.302 0.033   -9.283  0.000
7         yv1  ~              mv2        pb -0.113 0.033   -3.460  0.001
8         yv2  ~              mv1        pb -0.113 0.033   -3.460  0.001
9         yv1  ~              xv1        ac  0.235 0.045    5.257  0.000
10        yv2  ~              xv2        ac  0.235 0.045    5.257  0.000
11        yv1  ~              xv2        pc  0.156 0.045    3.483  0.000
12        yv2  ~              xv1        pc  0.156 0.045    3.483  0.000
13        xv1 ~1                         m1  4.264 0.032  132.841  0.000
14        xv2 ~1                        m1a  4.264 0.032  132.841  0.000
15        yv1 ~1                         m2  2.944 0.382    7.708  0.000
16        yv2 ~1                        m2a  2.944 0.382    7.708  0.000
17        mv1 ~1                         m3  5.482 0.434   12.636  0.000
18        mv2 ~1                        m3a  5.482 0.434   12.636  0.000
19        xv1 ~~            xv1          v1  0.248 0.021   11.852  0.000
20        xv2 ~~            xv2         v1a  0.248 0.021   11.852  0.000
21        yv1 ~~            yv1          v2  0.127 0.011   11.430  0.000
22        yv2 ~~            yv2         v2a  0.127 0.011   11.430  0.000
23        mv1 ~~            mv1          v3  0.390 0.033   11.954  0.000
24        mv2 ~~            mv2         v3a  0.390 0.033   11.954  0.000
25        xv1 ~~            xv2              0.057 0.021    2.744  0.006
26        yv1 ~~            yv2              0.046 0.011    4.166  0.000
27        mv1 ~~            mv2              0.074 0.033    2.261  0.024
28         ka :=          pa/aa         ka  0.609 0.197    3.096  0.002
29         kb :=          pb/ab         kb  0.373 0.108    3.463  0.001
30     AA_ie :=          aa*ab      AA_ie  0.134 0.026    5.080  0.000
31     AP_ie :=          aa*pb      AP_ie  0.050 0.017    3.006  0.003
32     PA_ie :=          pa*ab      PA_ie  0.082 0.024    3.433  0.001
33     PP_ie :=          pa*pb      PP_ie  0.031 0.012    2.526  0.012
34 total_ie_a :=      aa*ab+pa*pb total_ie_a  0.165 0.030    5.566  0.000
35 total_ie_p :=      aa*pb+pa*ab total_ie_p  0.132 0.030    4.453  0.000
36    total_a := aa*ab+pa*pb+ac    total_a  0.400 0.047    8.510  0.000
37    total_p := aa*pb+pa*ab+pc    total_p  0.288 0.047    6.120  0.000
38         v1 ==            v1a              0.000 0.000       NA     NA
39         v2 ==            v2a              0.000 0.000       NA     NA
40         v3 ==            v3a              0.000 0.000       NA     NA
41         m1 ==            m1a              0.000 0.000       NA     NA
42         m2 ==            m2a              0.000 0.000       NA     NA
43         m3 ==            m3a              0.000 0.000       NA     NA
   ci.lower ci.upper std.lv std.all
1    -0.589   -0.301 -0.445  -0.323
2    -0.589   -0.301 -0.445  -0.323
3    -0.415   -0.127 -0.271  -0.196
4    -0.415   -0.127 -0.271  -0.196
5    -0.366   -0.238 -0.302  -0.418
6    -0.366   -0.238 -0.302  -0.418
7    -0.176   -0.049 -0.113  -0.156
8    -0.176   -0.049 -0.113  -0.156
9     0.148    0.323  0.235   0.236
10    0.148    0.323  0.235   0.236
11    0.068    0.244  0.156   0.157
12    0.068    0.244  0.156   0.157
13    4.201    4.326  4.264   8.568
```

```
14     4.201     4.326  4.264     8.568
15     2.195     3.692  2.944     5.940
16     2.195     3.692  2.944     5.940
17     4.632     6.333  5.482     7.991
18     4.632     6.333  5.482     7.991
19     0.207     0.289  0.248     1.000
20     0.207     0.289  0.248     1.000
21     0.105     0.148  0.127     0.515
22     0.105     0.148  0.127     0.515
23     0.326     0.454  0.390     0.828
24     0.326     0.454  0.390     0.828
25     0.016     0.098  0.057     0.232
26     0.024     0.068  0.046     0.364
27     0.010     0.138  0.074     0.189
28     0.223     0.994  0.609     0.609
29     0.162     0.584  0.373     0.373
30     0.083     0.186  0.134     0.135
31     0.017     0.083  0.050     0.050
32     0.035     0.129  0.082     0.082
33     0.007     0.054  0.031     0.031
34     0.107     0.223  0.165     0.166
35     0.074     0.190  0.132     0.132
36     0.308     0.493  0.400     0.402
37     0.196     0.380  0.288     0.289
38     0.000     0.000  0.000     0.000
39     0.000     0.000  0.000     0.000
40     0.000     0.000  0.000     0.000
41     0.000     0.000  0.000     0.000
42     0.000     0.000  0.000     0.000
43     0.000     0.000  0.000     0.000
```

Mediation Run with Fixed k Values
lavaan (0.5-16) converged normally after 306 iterations

```
  Number of observations                          148

  Number of missing patterns                        1

  Estimator                                        ML
  Minimum Function Test Statistic              18.940
  Degrees of freedom                               14
  P-value (Chi-square)                          0.167
        lhs op          rhs     label   est     se           z
1       mv1 ~           xv1        aa -0.465 0.064      -7.224
2       mv2 ~           xv2        aa -0.465 0.064      -7.224
3       mv1 ~           xv2        pa -0.233 0.032      -7.224
4       mv2 ~           xv1        pa -0.233 0.032      -7.224
5       yv1 ~           mv1        ab -0.291 0.031      -9.343
6       yv2 ~           mv2        ab -0.291 0.031      -9.343
7       yv1 ~           mv2        pb -0.145 0.016      -9.343
8       yv2 ~           mv1        pb -0.145 0.016      -9.343
9       yv1 ~           xv1        ac  0.232 0.045       5.175
10      yv2 ~           xv2        ac  0.232 0.045       5.175
11      yv1 ~           xv2        pc  0.145 0.044       3.303
```

	lhs	op	rhs	label	est	se	z
12	yv2	~	xv1	pc	0.145	0.044	3.303
13	xv1	~1		m1	4.264	0.032	132.841
14	xv2	~1		m1a	4.264	0.032	132.841
15	yv1	~1		m2	3.061	0.368	8.308
16	yv2	~1		m2a	3.061	0.368	8.308
17	mv1	~1		m3	5.406	0.414	13.065
18	mv2	~1		m3a	5.406	0.414	13.065
19	xv1	~~	xv1	v1	0.248	0.021	11.852
20	xv2	~~	xv2	v1a	0.248	0.021	11.852
21	yv1	~~	yv1	v2	0.127	0.011	11.437
22	yv2	~~	yv2	v2a	0.127	0.011	11.437
23	mv1	~~	mv1	v3	0.390	0.033	11.955
24	mv2	~~	mv2	v3a	0.390	0.033	11.955
25	xv1	~~	xv2		0.057	0.021	2.744
26	yv1	~~	yv2		0.046	0.011	4.130
27	mv1	~~	mv2		0.073	0.033	2.249
28	ka :=		pa/aa	ka	0.500	NaN	NA
29	kb :=		pb/ab	kb	0.500	0.000	22582855.929
30	AA_ie :=		aa*ab	AA_ie	0.135	0.024	5.715
31	AP_ie :=		aa*pb	AP_ie	0.068	0.012	5.715
32	PA_ie :=		pa*ab	PA_ie	0.068	0.012	5.715
33	PP_ie :=		pa*pb	PP_ie	0.034	0.006	5.715
34	total_ie_a :=		aa*ab+pa*pb	total_ie_a	0.169	0.030	5.715
35	total_ie_p :=		aa*pb+pa*ab	total_ie_p	0.135	0.024	5.715
36	total_a :=		aa*ab+pa*pb+ac	total_a	0.401	0.047	8.495
37	total_p :=		aa*pb+pa*ab+pc	total_p	0.280	0.045	6.211
38	pa ==		0.5*aa		0.000	0.000	NA
39	pb ==		0.5*ab		0.000	0.000	NA
40	v1 ==		v1a		0.000	0.000	NA
41	v2 ==		v2a		0.000	0.000	NA
42	v3 ==		v3a		0.000	0.000	NA
43	m1 ==		m1a		0.000	0.000	NA
44	m2 ==		m2a		0.000	0.000	NA
45	m3 ==		m3a		0.000	0.000	NA

	pvalue	ci.lower	ci.upper	std.lv	std.all
1	0.000	-0.591	-0.339	-0.465	-0.338
2	0.000	-0.591	-0.339	-0.465	-0.338
3	0.000	-0.296	-0.170	-0.233	-0.169
4	0.000	-0.296	-0.170	-0.233	-0.169
5	0.000	-0.352	-0.230	-0.291	-0.401
6	0.000	-0.352	-0.230	-0.291	-0.401
7	0.000	-0.176	-0.115	-0.145	-0.201
8	0.000	-0.176	-0.115	-0.145	-0.201
9	0.000	0.144	0.319	0.232	0.232
10	0.000	0.144	0.319	0.232	0.232
11	0.001	0.059	0.230	0.145	0.145
12	0.001	0.059	0.230	0.145	0.145
13	0.000	4.201	4.326	4.264	8.568
14	0.000	4.201	4.326	4.264	8.568
15	0.000	2.339	3.783	3.061	6.166
16	0.000	2.339	3.783	3.061	6.166
17	0.000	4.595	6.217	5.406	7.890
18	0.000	4.595	6.217	5.406	7.890
19	0.000	0.207	0.289	0.248	1.000

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20  0.000    0.207    0.289  0.248    1.000
21  0.000    0.105    0.149  0.127    0.515
22  0.000    0.105    0.149  0.127    0.515
23  0.000    0.326    0.454  0.390    0.831
24  0.000    0.326    0.454  0.390    0.831
25  0.006    0.016    0.098  0.057    0.232
26  0.000    0.024    0.068  0.046    0.362
27  0.024    0.009    0.137  0.073    0.188
28    NA      NaN      NaN   0.500    0.500
29  0.000    0.500    0.500  0.500    0.500
30  0.000    0.089    0.182  0.135    0.136
31  0.000    0.044    0.091  0.068    0.068
32  0.000    0.044    0.091  0.068    0.068
33  0.000    0.022    0.045  0.034    0.034
34  0.000    0.111    0.227  0.169    0.170
35  0.000    0.089    0.182  0.135    0.136
36  0.000    0.308    0.493  0.401    0.402
37  0.000    0.192    0.368  0.280    0.280
38    NA    0.000    0.000  0.000    0.000
39    NA    0.000    0.000  0.000    0.000
40    NA    0.000    0.000  0.000    0.000
41    NA    0.000    0.000  0.000    0.000
42    NA    0.000    0.000  0.000    0.000
43    NA    0.000    0.000  0.000    0.000
44    NA    0.000    0.000  0.000    0.000
45    NA    0.000    0.000  0.000    0.000
```

4. Figures

APIM Mediation (Standardized Estimates)
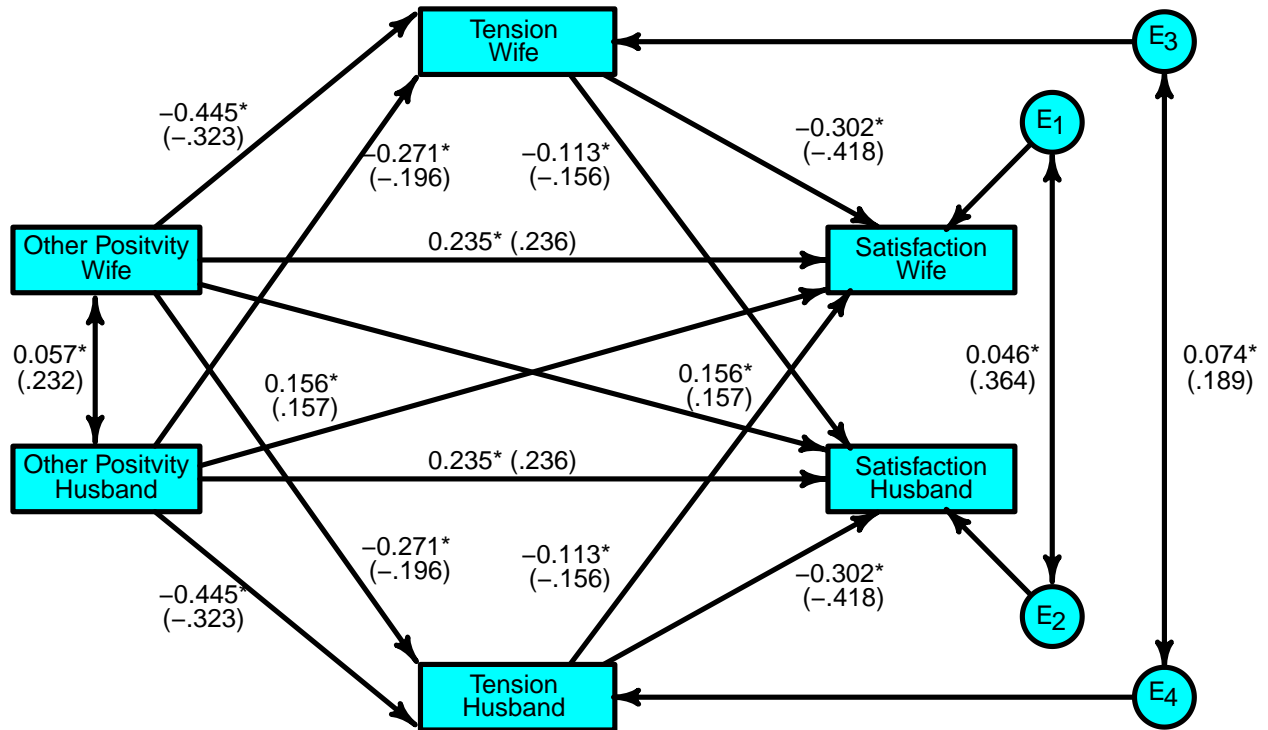
APIMeM with Fixed k Values (Standardized Estimates)