APIMeM Output

Actor-Partner Interdependence Mediation Model Results
March 27, 2017

1. Text

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<p align="center">Summary of APIM Mediation Results</p>

The focus of this study is the investigation of the mediation of effect of Other Positivity 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 variable names in the dataset are as follows: Other Positivity for Wife is OtherPos_W, Other Positivity for Husband is OtherPos_H, Satisfaction for Wife is Satisfaction_W, Satisfaction for Husband is Satisfaction_H, Tension for Wife is Tension_W, and Tension for Husband is Tension_H. 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 Positivity and Tension. Additionally, it must be assumed that there are no unmeasured common causes (i.e., confounders) between Other Positivity and Tension, between Other Positivity and Satisfaction, and between Tension and Satisfaction. It must be assumed that Satisfaction does not cause Other Positivity or Tension and that Tension does not cause Other Positivity. Finally, it must be assumed that Other Positivity and Tension do not interact to cause Satisfaction.

The test of whether Other Positivity interacts with Tension can be conducted by forming four product terms: Actor for Other Positivity by Actor for Tension, Actor for Other Positivity by Partner for Tension, Partner for Other Positivity by Actor for Tension, and Partner for Other Positivity by Partner for Tension. The combined test these four moderation effects involves fitting two models, one with interaction effects and one without those effects. This combined test of interaction is statistically significant (chi-square(4) = 31.29, p < .001), with an RMSEA of 0.215. Because the RMSEA is greater than .10 and the chi square is statistically significant, there is sufficient evidence to believe that there is an interaction and a violation of standard linear mediation model.

For the 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 of three indirect effect 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 Positivity 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 0.426 to 0.704. 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 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 -0.188 to 0.576. It can be concluded that the contrast (k = -1) and the couple (k = 1) models are implausible and that the actor-only model (k = 0) is plausible. Lastly considered are the effects of Other Positivity 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 Positivity on Satisfaction are contained in Table 3. Consider first the actor effect from Other Positivity 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: 0.046 to 0.286) 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: 0.065 to 0.218) 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: -0.008 to 0.078) with a standardized effect of .031 and it explains 7.62 percent of the total effect. Next considered is the partner effect from Other Positivity 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: 0.022 to 0.262) 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: -0.014 to 0.120) 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: 0.031 to 0.147) 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 Positivity on Tension has been set to 1.000 and that constant or k from Tension on Satisfaction has been set to 1.000. The fit of this model is a chi square with 2 degrees of freedom that equals 22.212 (p < .001). The SABIC for this model is 68.026 and the base model is 49.480. The RMSEA for this model is 0.262. Thus, the data appear to be inconsistent with these values of k.

Table 4 presents the effects in the mediational model with these fixed values of k. The multiple correlation for the Tension equations is .407 and the multiple correlation for the Satisfaction equations is .679. (Tests of partner effects may not be very interpretable because because their effects are constrained.) First considered are the effects of Other Positivity on Tension. The actor effect equals -0.358 (p < .001) with a standardized effect of -.260. The partner effect equals -0.358 (p < .001) with a standardized effect of -.260. Next considered are the effects of Tension on Satisfaction. The actor effect equals -0.207 (p < .001) with a standardized effect of -.287. The partner effect equals -0.207 (p < .001) with a standardized effect of -.287. Lastly considered are the effects of Other Positivity on Satisfaction. The actor effect equals 0.252 (p < .001) with a standardized effect of .253. The partner effect equals 0.140 (p = .002) with a standardized effect of .140.

The four simple indirect, two direct, two total indirect, and two total effects of Other Positivity on Satisfaction are contained in Table 5. (Tests of actor-partner, partner-actor, and partner-partner indirect effects may not be very interpretable because because partner effects are contrained.) Considered first is the actor effect from Other Positivity to Satisfaction. The total actor effect equals 0.400 (0.308 to 0.493) with a standardized effect of .402. The direct effect equals 0.252 (confidence interval: 0.162 to 0.252) with a standardized effect of .253 and it explains 62.93 percent of the total effect. There are two indirect effects: The total actor indirect effect equals 0.148 (confidence interval: 0.071 to 0.298) with a standardized effect of .149 and it explains 37.07 percent of the total effect. The actor-actor indirect effect equals 0.074 (confidence interval: 0.021 to 0.139) with a standardized effect of .075 and it explains 18.54 percent of the total effect. The partner-partner indirect effect equals 0.074 (confidence interval: 0.021 to 0.138) with a standardized effect of .075 and it explains 18.54 percent of the total effect. Next considered is the partner effect from Other Positivity to Satisfaction. The total partner effect equals 0.288 (0.196 to 0.380) with a standardized effect of .402. The direct effect equals 0.252 (confidence interval: 0.050 to 0.140) with a standardized effect of .140 and it explains 48.45 percent of the total effect. There are two indirect effects: The total partner indirect effect equals 0.148 (confidence interval: 0.049 to 0.277) with a standardized effect of .149 and it explains 51.55 percent of the total effect. The actor-partner indirect effect equals 0.074 (confidence interval: 0.021 to 0.138) with a standardized effect of .075 and it explains 25.78 percent of the total effect. The partner-partner indirect effect equals 0.074 (confidence interval: 0.021 to 0.139) with a standardized effect of .075 and it explains 25.78 percent of the total effect.

2. Tables

Table 1: Descriptive Statistics

Variable	Mean	SD	Minimum	Maximum
Other Positivity	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 Positivity	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

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Other Positivity Satisfaction   Actor     0.235   <.001  0.148   to    0.323          0.236
                                Partner   0.156   <.001  0.068   to    0.244          0.157
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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	0.046	to	0.286	0.166	41.19
	Actor-Actor Indirect	0.134	<.001	0.065	to	0.218	0.135	33.57
	Partner-Partner Indirect	0.031	.012	-0.008	to	0.078	0.031	7.62
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	0.022	to	0.262	0.270	45.82
	Actor-Partner Indirect	0.050	.003	-0.014	to	0.120	0.050	17.40
	Partner-Actor Indirect	0.082	<.001	0.031	to	0.147	0.082	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 Positivity	Tension	Actor	-0.358	<.001	-0.457	to	-0.259	-0.260
		Partner	-0.358	<.001	-0.457	to	-0.259	-0.260
Tension	Satisfaction	Actor	-0.207	<.001	-0.257	to	-0.158	-0.287
		Partner	-0.207	<.001	-0.257	to	-0.158	-0.287
Other Positivity	Satisfaction	Actor	0.252	<.001	0.162	to	0.342	0.253
		Partner	0.140	.002	0.050	to	0.229	0.140

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	0.400	<.001	0.308	to	0.493	0.402	
	Direct	0.252	<.001	0.162	to	0.342	0.253	62.93
	Total Indirect	0.148	<.001	0.071	to	0.298	0.149	37.07
	Actor-Actor Indirect	0.074	<.001	0.021	to	0.139	0.075	18.54
	Partner-Partner Indirect	0.074	<.001	0.021	to	0.138	0.075	18.54
Partner	Total	0.288	<.001	0.196	to	0.380	0.289	
	Direct	0.140	.002	0.050	to	0.229	0.140	48.45
	Total Indirect	0.148	<.001	0.049	to	0.277	0.149	51.55
	Actor-Partner Indirect	0.074	<.001	0.021	to	0.138	0.075	25.78
	Partner-Actor Indirect	0.074	<.001	0.021	to	0.139	0.075	25.78

3. lavaan Computer Output

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Mediation Run with Indistinguishable Dyads

lavaan (0.5-22) converged normally after  40 iterations

  Number of observations                          148

  Number of missing patterns                        1

  Estimator                                        ML
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   Minimum Function Test Statistic              17.293
   Degrees of freedom                              12
   P-value (Chi-square)                          0.139
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	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
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	5.256	0.000
10	yv2	~	xv2	ac	0.235	0.045	5.256	0.000
11	yv1	~	xv2	pc	0.156	0.045	3.482	0.000
12	yv2	~	xv1	pc	0.156	0.045	3.482	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

	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

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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    3.693  2.944    5.940
16    2.195    3.693  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
```

Mediation Run with Fixed k Values
lavaan (0.5-22) converged normally after 47 iterations

```
  Number of observations                            148

  Number of missing patterns                          1

  Estimator                                          ML
  Minimum Function Test Statistic                39.504
  Degrees of freedom                                 14
  P-value (Chi-square)                            0.000
        lhs op        rhs    label   est     se             z
1       mv1  ~        xv1       aa -0.358 0.051        -7.063
2       mv2  ~        xv2       aa -0.358 0.051        -7.063
3       mv1  ~        xv2       pa -0.358 0.051        -7.063
4       mv2  ~        xv1       pa -0.358 0.051        -7.063
5       yv1  ~        mv1       ab -0.207 0.025        -8.266
6       yv2  ~        mv2       ab -0.207 0.025        -8.266
7       yv1  ~        mv2       pb -0.207 0.025        -8.266
8       yv2  ~        mv1       pb -0.207 0.025        -8.266
9       yv1  ~        xv1       ac  0.252 0.046         5.505
10      yv2  ~        xv2       ac  0.252 0.046         5.505
11      yv1  ~        xv2       pc  0.140 0.046         3.048
12      yv2  ~        xv1       pc  0.140 0.046         3.048
13      xv1 ~1                  m1  4.264 0.032       132.841
14      xv2 ~1                 m1a  4.264 0.032       132.841
15      yv1 ~1                  m2  2.944 0.382         7.708
```

16	yv2 ~1		m2a	2.944	0.382	7.708
17	mv1 ~1		m3	5.482	0.434	12.636
18	mv2 ~1		m3a	5.482	0.434	12.636
19	xv1 ~~	xv1	v1	0.248	0.021	11.852
20	xv2 ~~	xv2	v1a	0.248	0.021	11.852
21	yv1 ~~	yv1	v2	0.132	0.011	11.633
22	yv2 ~~	yv2	v2a	0.132	0.011	11.633
23	mv1 ~~	mv1	v3	0.393	0.033	11.972
24	mv2 ~~	mv2	v3a	0.393	0.033	11.972
25	xv1 ~~	xv2		0.057	0.021	2.744
26	yv1 ~~	yv2		0.040	0.011	3.559
27	mv1 ~~	mv2		0.071	0.033	2.160
28	ka :=	pa/aa	ka	1.000	0.000	171670363.737
29	kb :=	pb/ab	kb	1.000	0.000	108004859.606
30	AA_ie :=	aa*ab	AA_ie	0.074	0.014	5.370
31	AP_ie :=	aa*pb	AP_ie	0.074	0.014	5.370
32	PA_ie :=	pa*ab	PA_ie	0.074	0.014	5.370
33	PP_ie :=	pa*pb	PP_ie	0.074	0.014	5.370
34	total_ie_a :=	aa*ab+pa*pb	total_ie_a	0.148	0.028	5.370
35	total_ie_p :=	aa*pb+pa*ab	total_ie_p	0.148	0.028	5.370
36	total_a :=	aa*ab+pa*pb+ac	total_a	0.400	0.047	8.510
37	total_p :=	aa*pb+pa*ab+pc	total_p	0.288	0.047	6.120

	pvalue	ci.lower	ci.upper	std.lv	std.all
1	0.000	-0.457	-0.259	-0.358	-0.260
2	0.000	-0.457	-0.259	-0.358	-0.260
3	0.000	-0.457	-0.259	-0.358	-0.260
4	0.000	-0.457	-0.259	-0.358	-0.260
5	0.000	-0.257	-0.158	-0.207	-0.287
6	0.000	-0.257	-0.158	-0.207	-0.287
7	0.000	-0.257	-0.158	-0.207	-0.287
8	0.000	-0.257	-0.158	-0.207	-0.287
9	0.000	0.162	0.342	0.252	0.253
10	0.000	0.162	0.342	0.252	0.253
11	0.002	0.050	0.229	0.140	0.140
12	0.002	0.050	0.229	0.140	0.140
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	2.195	3.693	2.944	5.940
16	0.000	2.195	3.693	2.944	5.940
17	0.000	4.632	6.333	5.482	7.991
18	0.000	4.632	6.333	5.482	7.991
19	0.000	0.207	0.289	0.248	1.000
20	0.000	0.207	0.289	0.248	1.000
21	0.000	0.110	0.155	0.132	0.539
22	0.000	0.110	0.155	0.132	0.539
23	0.000	0.328	0.457	0.393	0.834
24	0.000	0.328	0.457	0.393	0.834
25	0.006	0.016	0.098	0.057	0.232
26	0.000	0.018	0.063	0.040	0.306
27	0.031	0.007	0.135	0.071	0.180
28	0.000	1.000	1.000	1.000	1.000
29	0.000	1.000	1.000	1.000	1.000
30	0.000	0.047	0.101	0.074	0.075
31	0.000	0.047	0.101	0.074	0.075

32	0.000	0.047	0.101	0.074	0.075
33	0.000	0.047	0.101	0.074	0.075
34	0.000	0.094	0.203	0.148	0.149
35	0.000	0.094	0.203	0.148	0.149
36	0.000	0.308	0.493	0.400	0.402
37	0.000	0.196	0.380	0.288	0.289

4. Figures

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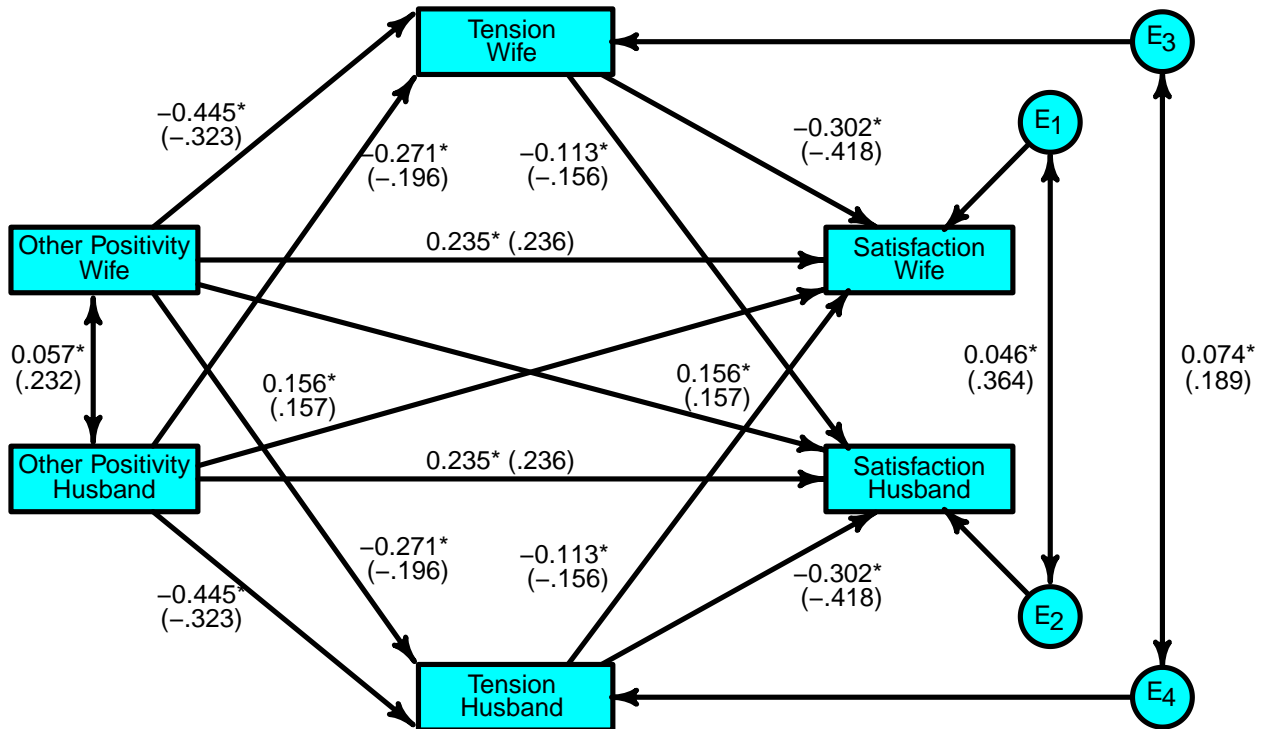
APIMeM with Fixed k Values (Standardized Estimates)