**Explained Nonindependence**

 **We can ask the question to what extent does the APIM explain nonindependence. Actor and partner effects, by themselves do not explain nonindependence, but rather they do so in combination with other effects. There are four ways in which the APIM explains nonindependence. First, *X*1 is a common cause of *Y*1 and *Y*2 as below:**

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**Second, *X*2 is a common cause of *Y*1 and *Y*2 as below:**

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**Third, there is case where there is correlation due to the two actor effects and the correlation between *X*1 and *X*2:**

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**Fourth, there is case where there is correlation due to the two partner effects and the correlation between *X*1 and *X*2:**

****

**The combination of these four effects measures the total explained covariation.**

**Indistinguishable Dyads**

**The actor-partner model explains 2*ap* + *rxx*(*a*2 + *p*2) of the nonindependence where *a* and *p* are the *standardized* actor and partner effects and *rxx* is the intraclass correlation of the actor and partner variables. (Here and below to get at the explained covariation, one needs to multiply by *sY*2.) For the Other-Positivity and Satisfaction example, *rxx* = .235 making the explained nonindependence .290. The unexplained nonindependence is equal to *ree* times 1 minus the multiple correlation for *Y*. However, one should not use the pseudo R2 but rather the standard *R*2 which equals *a*2 + *p*2 + 2*aprxx*. Using these values for the example, the *R*2 is .300 and the unexplained correlation is .328. If we sum the explained and unexplained nonindependence, we obtain .618, which equals the intraclass correlation for Satisfaction with no predictors.**

**Distinguishable Dyads**

**The actor-partner model explains *a*1*p*1 + *a*2*p*2 + *rxx*(*a*1*a*2 + *p*1*p*2) of the nonindependence where *a*1, *a*2, *p*1, and *p*2 are the *standardized* actor and partner effects and *rxx* is the correlation of the actor and partner variables. Note that the standardization is not across the whole sample, but with the 1s and 2s. For the Other-Positivity and Satisfaction example, *rxx* = .235 making the explained nonindependence equals .294. The unexplained nonindependence is equal to *ree* times the square root of the product of 1 minus the multiple correlation of *Y* for the 1s and the 2s. However, one should not use the pseudo R2 but rather the standard *R*2 which equals *a*12 + *p*12 + 2*a*1*p*1*rxx* for the 1s and *a*22 + *p*22 + 2*a*2*p*2*rxx* for the 2s. Using these values for the example we obtain .272 for *R*12 and .338 for *R*22, which results in .330 for unexplained correlation. If we sum the explained and unexplained nonindependence, we obtain .623, which equals the simple correlation for Satisfaction with no predictors.**

**Summary**

**Thus, it is possible to compute the extent to which nonindependence is explained by actor and partner effects. Note that it may be the case that nonindependence might well be negative and correlation explained might be negative too.**

**If there are covariates, there are three additional sources of nonindependence: that due to each covariate, that due to correlation between covariates, and that due the correlation between the covariates and the mixed variables. All of these computations are now done in the app APIM\_MM (**[**https://davidakenny.shinyapps.io/APIM\_MM/**](https://davidakenny.shinyapps.io/APIM_MM/)**).**