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Reply-To: SEMNET Discussion List <SEMNET@UA1VM.UA.EDU>
Sender: SEMNET Discussion List <SEMNET@UA1VM.UA.EDU>
From: Janet Barnes-Farrell <BARNES@PSYCH.PSY.UCONN.EDU>
Organization: UConn Department of Psychology
Subject: comment on tests of mediation
Comments: cc: kenny@uconnvm.uconn.edu

Dear SEMnetters,

I am posting the following for a colleague (David Kenny) who does not currently subscribe to SEMNET. I will forward any comments or responses posted on the list to Dave, or you can contact him directly at the following address:

david,kenny@uconn.edu

Janet Barnes-Farrell

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Dave's post follows.....

Together with Franciska Krings, I have looked closely at the comparison of raw and partial correlations as a test of mediation. She and I have decided that it is not a good idea. Let me elaborate what is that we have found.

Imagine that we have X, Z, and Y where Z is presumed to mediate the X to Y relationship. So Z is the presumed mediator. Without loss of generality, all variables are standardized. In equation form, we have

$$Z = aX + U$$

$$Y = bZ + cX + V$$

where U and V are residuals in the regression equation. We assume that the mediation is correctly specified. We denote the effect of X on Y ignoring Z, the regression coefficient, as d. The coefficient d is the correlation between X and Y and the coefficient c is the partial regression (not correlation) of X and Y.

What some have argued for is to compare is d to the partial correlation between X and Y controlling for Z. it is easy to show that this partial correlation equals

$$c*sqr(1 - r(X,Z)*r(X,Z))/sqr(1 - r(Z,Y)*r(Z,Y))$$

where "sqr" means square root and "*" means multiplication. Note that what we think should be measured for mediation is not the partial r but the partial regression coefficient or c. The difference between the two is just a function of

$$sqr(1 - r(X,Z)*r(X,Z))/sqr(1 - r(Z,Y)*r(Z,Y))$$

which will be larger than less than one when r(X,Z)/r(Z,Y) is greater than one, assuming that the correlations are all positive.

What Ms. Krings and I have worked out that if b = 0, that is the mediator has no effect on the outcome, the partial correlation will decline even though there is no mediation at all. Note that if b = 0, then

r(X,Z) = a

r(X,Y) = c

r(Z,Y) = ac

The partial correlation would equal c*sqr(1 - a*a)/sqr(1 - ac*ac). Note that if c is nonzero then the partial correlation must be less than the raw correlation, c. So it seems to us that the partial correlation is not a good idea if one believes there is mediation. If you think is mediation, directly estimate a mediational model.

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