**Mediation**

File name: ex3.16\_modconst\_bcbootstrap\_c.out

**Analysis Plan**

A path analysis was conducted to test the study hypotheses that y3 is predicted by x1 indirectly via y1 and y2, controlling for x2 and x3. All variables were scored on a continuous scale and were normally distributed. A path model is presented in Figure 1. Our analyses were conducted using Mplus 7.4 (Muthén & Muthén, 1998–2012).

The primary challenge in making appropriate determinations regarding the strength of an indirect effect is that the product of two regression slopes is not normally distributed. The violation of the normality assumption results in a loss of statistical power for many traditional approaches to testing mediation (e.g., the Sobel Test). In order, to circumvent this issue the best practices approach is to assess asymmetrical confidence intervals (ACIs) that best represent the true distribution of the product of coefficients. ACIs that do not contain zero are considered to be statistically significant. We examined the indirect effects of each predictor variable on outcomes using bias-corrected bootstrapped estimates (Efron & Tibshirani, 1993) based on 1,000 bootstrapped samples, which provides a powerful test of mediation (Fritz & MacKinnon, 2007) and are asymmetrical. Statistical significance was determined by 95% bias-corrected bootstrapped confidence intervals that do not contain zero. We further evaluated the effect size of our indirect effects using Lachowicz, Preacher, and Kelley’s (2017, under review) 𝝊 index of effect size, which examines the total joint variance in Y accounted for by the IV and the Mediator(s) using the MBESS (Kelley & Lai, 2010) R (R Development Core Team, 2010) package.

To evaluate overall model fit, we used model fit criteria suggested by Hu and Bentler (1999) including the comparative fit index (CFI) > .95, Tucker–Lewis Index (TLI) > .95, root mean square error of approximation (RMSEA) < .06, and standardized root mean square residual (SRMR) < .08. In addition, we evaluated the Chi-Square test of model fit, where a non-significant test indicates perfect fit of the model to the data.

**Results**

*Overall Model Fit.* The path analysis resulted in excellent model fit. The Chi-Square test of model fit was not significant (χ2(2) = .001, p = .99). Overall fit indices were all in the excellent range (RMSEA = .00 [.00, .00]; CFI = 1.00; TLI = 1.00; SRMR = .000).

*Direct Effects.* All direct effects specified in the model were significant. Specifically, x1, x2, and x3 significantly and positively predicted y1 (x1: b = .99, SE = .04, p < .001; x2: b = 2.00, SE = .04, p < .001; x3: b = 3.05, SE = .04, p < .001), y2 (x1: b = 2.94, SE = .05, p < .001; x2: b = 1.99, SE = .05, p < .001; x3: b = 1.023, SE = .05, p < .001), and y3 (y1: b = .497, SE = .02, p < .001; y2: b = .78, SE = .05, p < .001; x1: b = -.119, SE = .05, p < .001; x2: b = .990, SE = .1, p < .001). This suggests that higher values of x1, x2, and x3 were associated with higher values of y1, y2, and y3.

*Indirect Effects.* Examination of the bias-corrected bootstrapped confidence intervals revealed that the total effect and both specific indirect effects were statistically significant (Total = 2.69 [2.58, 2.82]; y3-y1-x1 = .50 [.45, .56]; y3-y2-x1 = 2.29 [2.06, 2.32]).

We examined two indices of effect size (a)Pm = ab/c (Alwin & Hauser, 1975), which is the ratio of the indirect effect to the total effect, and 𝝊 (Lachowicz et al., 2017, under review) which is the total joint variance in the DV accounted for by the IV and the Mediator(s). The ratio of the indirect to total effect for the x1-y1-y3 path was Pm = 1.32, and, Pm for the x1-y2-y3 was 1.06.

However, in the present model Pm should be interpreted with caution because of the small magnitude of c’. Pm becomes increasingly unstable as c’ approach 0, and in the current model c’ was -.119. Indeed, Pm in the current models exceeds 1, which makes it more difficult to interpret. However, it is clear that the indirect effect is stronger than the total effect in the present model. Comparing indirect effects using a more rigorous effect size 𝝊, we can see that X1 and y1 accounted for (𝝊 = .005) of the joint variance in y3 while, x1 and y2 accounted for (𝝊 = .003) of the total joint variance in y3. A comparative interpretation of 𝝊 suggests that x1 and y1 explain nearly twice the joint variance in y3 compared to x1 and y2.

**Discussion**

The present study demonstrated that x1 influences y3 indirectly via y1 and y2. Further, we can see that y1 is a stronger mediator of the x1-y3 relationship compared to y2. However, the magnitude of these indirect effects are hard to interpret given the small size of c’. Thus, it is not possible to rule out the need to consider additional predictors of y3, as well as additional predictors of the x1-y3 relationship. In addition, the results indicated that x1, x2, and x3 were all directly positively associated with y1, y2, and y3.