A Novel Effect Size Measure for Mediation with a Multicategorical Predictor

Zihuan Cao[1], Heining Cham[2], Jordan Stiver[3], and Monica Rivera Mindt[4]
[1] zcao22@fordham.edu, [2] hcham@fordham.edu,
[3] jstiver@fordham.edu, [4] riveramindt@fordham.edu
Fordham University
Psychology Department

FORDHAM UNIVERSITY

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INTRODUCTION

- Numerous effect size measures for mediation face limitations when dealing with a nominal predictor encompassing three or more categories. To tackle this issue, the mediation effect size measure **υ** was introduced.
- We conducted comprehensive simulation study with various factors in data generation and effect size estimation, and we presented an empirical example to illustrate its usage.

METHODS

1. Five factors were manipulated in the simulation study: number of groups in X, sample size per group, effect size of ai paths, size of b path, and effect size of c'i paths; 720 conditions with 10,000 replications for each condition.
2. Performance evaluators: bias, standardized bias, mean squared error (MSE), and coverage rate.
3. ANOVAs were conducted to study the effects of each factor, followed by post-hoc pairwise comparisons and boxplots.

RESULTS

1. The Olkin-Pratt extended method on the sample estimator of **υ** (**υ̃**_OPE) had the least bias and the lowest mean squared error (MSE). See **Table 1**.
2. R-squared methods and unadjusted method had large biases.
3. As **Figure 1** shows, the adjusted sample estimator was highly influenced by b path size (along with effects of ai paths' effect size, c'i paths' effect size, and number of groups).

FINDINGS & CONCLUSIONS

- We extended the mediation effect size **υ** to multicategorical predictor mediation models.
- The current study showed that **υ** lacked some desirable properties in this scenario.
- There are couple factors affecting **υ** estimator accuracy: size of b path, small effects in ai paths
- R-squared shrinkage methods could not effectively reduce bias of **υ** estimates
- Recommendation: Use **υ**˜OPE for simple mediation models with multicategorical predictors
- Cautionary scenarios that **υ** may be inappropriate: Large b path (0.39-0.59), small effects in ai paths, small group sizes (n = 10)

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Table 1: Comparison of sample estimators of υ across conditions.

Sample Estimator	Bias	Standardized Relative Bias	MSE	Coverage Rate
Unadjusted $\hat{\upsilon}$	.02314	.56756	.00430	71.67%
Claudy $\tilde{\upsilon}$ ($\tilde{\upsilon}_{Claudy}$)	.02191	.64609	.00445	66.62%
Ezekiel $\tilde{\upsilon}$ ($\tilde{\upsilon}_{\text{Ezekiel}}$)	.02184	.62681	.00439	63.48%
Olkin-Pratt $\tilde{\upsilon}$ ($\tilde{\upsilon}_{OP}$)	.02103	.65311	.00426	67.43%
Olkin-Pratt Extended $\tilde{\upsilon}$ ($\tilde{\upsilon}_{OPE}$)	.02080	.65121	.00422	67.64%
Pratt $\tilde{\upsilon}$ ($\tilde{\upsilon}_{\text{Pratt}}$)	.02088	.66614	.00423	67.54%
Smith $\tilde{\upsilon}$ ($\tilde{\upsilon}_{\text{Smith}}$)	.02171	.52229	.00439	66.79%
Walker $\tilde{\upsilon}$ ($\tilde{\upsilon}_{\text{Walker}}$)	.02204	.64510	.00448	66.44%
Wherry $\tilde{\upsilon}$ ($\tilde{\upsilon}_{\text{Wherry}}$)	.02253	.52666	.00457	64.84%

Figure 1: Boxplot of effect of *b* path on bias of υ˜_OPE.