An Exploration of Two Artifact Correction Procedures for Correcting Correlated Reliabilities in Meta-analysis

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Background

Artifact Correction: originated from validity generalization studies (Schmidt, Hunter & Urry, 1976); it is the intersection between meta-analysis and psychometrics (Hunter & Schmidt, 2004).

Artifacts include sampling errors, measurement errors, range restriction/attrition, construct imperfection, variable dichotomization, reporting or transcriptional error, extraneous factors that affect the relationship. Artifact correction meta-analysis generally assumes p**airwise independent relationships among artifacts**

Research Challenges

Disconnection between the focus of methodology development and the practical use

- Individual vs. Distributional correction
- Monte-Carlo testing vs. Real-world studies

Issues in correcting measurement errors

- The necessity of correction (High low values; with range restriction)
- The use of mixed types of reliability estimates (Murphy, 2003)
- The assumption of independent artifacts (Kohler, Cortina, Kurtessis Golz, 2015)

Overall objective

To empirically examine the impact of individual artifact correction for correlated reliabilities on meta-analytic parameter estimates.

Two Procedures

The correlation-based artifact correction is built upon the theory that artifacts attenuate the true correlation coefficient by a multiplicative fraction (Schmidt, Hunter, Urry, 1976; **Hunter-Schmidt Procedure**). $r_i = \rho_i \sqrt{r_{X_i X_i}} \sqrt{r_{Y_i Y_i}} + e_{r_i}$ (1), where

e_{r_i} is denoted to represent the sampling error associated with r_i

Raju, Burke, Normand & Langlois (**RBNL Procedure**, 1991) $\hat{\rho}_i = \rho_i + e_i$ (2), where

ρ_i is the unrestricted and unattenuated population correlation.
$\hat{\rho}_i$ is an estimate of the unattenuated and unrestricted population correlation.
e_i is the sampling error associated with $\hat{\rho}_i$

Methods

Sampling/Data Search: Sample studies included in Kohler, Cortina, Kurtessis & Golz (2015)

- Both published and unpublished citations
- The timeframe between1986 to 2011
- Key words *perceived Organizational support*, *organizational support*, *perceived support*, *POS*

277 studies retrieved studies meet this criteria (this number can be increase by searching and including studies that were conducted or published after 2011

POS: perceived organizational support; JP: job performance;
OCBO-organizational citizen behavior-to organization (Table 1)

Table 1
Research Design and Organization

	Study 1		Study 2	
X (reliability type)	POS (internal consistency)		POS (internal consistency)	
Average Reliability for X	0.8905	0.8965	0.8948	0.9111
Y (reliability type)	JP self-rated (internal consistency)	JP other-rated (intra-rater)	OCB-O self-rated (internal consistency)	OCB-O other-rated (intra-rater)
Average Reliability for Y*	0.8247	0.8785	0.8104	0.8478

Note. Each of the bivariate correlation ρ_{XY} will be meta-analyzed by Bare-Bone, Hunter-Schmidt, and RBNL methods.
*Reliabilities between JP internal consistency and JP Intra-rater are significantly different from each other; Reliabilities between OCB-O internal consistency and OCB-O intra-rater are significantly different from each other

Result Summary

Table 2
Meta-analysis Estimations for Each Pair and Between Pair Comparisons

	Study 1		Study 2	
X (reliability type)	POS (internal consistency)		POS (internal consistency)	
Y (reliability type)	JP self-rated (internal consistency)	JP other-rated (intra-rater)	OCB-O self-rated (internal consistency)	OCB-O other-rated (intra-rater)
Number of studies	44	79	86	116
Correlation between Reliabilities	0.2873	0.4144*	0.1190	0.1052
RBNL estimations	0.2340	0.1734	0.4920	0.2255
M_ρ, V_ρ	0.0213	0.0089	0.0881	0.0462
Hunter-Schmidt estimations	0.2437	0.1746	0.5037	0.2267
	0.0195	0.0084	0.0877	0.0453
Bare-Bones estimations	0.2031	0.1541	0.4246	0.1977
	0.0161	0.0070	0.0694	0.0352
M_ρ Comparison between 3 procedures	Not statistically significant	Not statistically significant	Not statistically significant	Not statistically significant
M_ρ Comparison between the two pairs	Not statistically significant		Not statistically significant	

*significant testing was based on alpha=0.05 using z test

- There were no statistically significant difference between the population validity estimates from the three different procedures. (RBNL is known that overestimates the true validity the least).
- However, RBNL procedure provided the largest variance estimates among the three procedures and Bare-Bone procedure provided the least variance estimates. (This actually contradicts to Mont-Carlo conclusion that RBNL tends to produce smaller sampling variances).
- Although the correlations between reliabilities were significant for the pair of intra-rater of JP and internal consistency of POS, it does not appear that the population estimates deviated too much from the set of meta-analytic estimates generated from the data where the correlation between reliabilities of JP internal consistency and POS internal consistency was not significant.

Reference

Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings* (2nd ed.). Thousand Oaks, CA: Sage.
Köhler, T., Cortina, J., Kurtessis, J., & Gölz, M. (2015). Are We Correcting Correctly? *Organizational Research Methods*, *18*(3), 355-428.
Raju, N., Anselmi, T., Goodman, J., & Thomas, A. (1998). The Effect of Correlated Artifacts and True Validity on the Accuracy of Parameter Estimation in Validity Generalization. *Personnel Psychology, 51*(2), 453-465.