Handling Missing Covariates in Mixed-Effects Meta-Analysis with Full-Information Maximum Likelihood

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Meta-analysis is the de facto method to summarize research findings in many disciplines. As studies are rarely direct replicates of each other, it is reasonable to expect that each study has its population effect size. A random-effects model is generally preferred to synthesize the effect sizes. When there is excessive heterogeneity, researchers may want to explore the heterogeneity by using study characteristics as the covariates, which are also called the moderators in a meta-analysis. The statistical model is generally known as a mixed-effects meta-analysis or meta-regression.

It is unavoidable to observe missing values in the covariates. The presence of missing values creates several problems in the meta-analysis. First, the mixed-effects meta-analytic model assumes complete data. Researchers have to decide how to handle the missing data. Almost all programs in mixed-effects meta-analysis will delete studies with missing covariates before the analyses. This approach will exclude many valuable studies. If the missingness of the covariates is not missing completely at random, the parameter estimates and their standard errors can be biased. Second, current applications of mixed-effects meta-analysis almost analyze the covariates one by one. This approach cannot compare the unique contributions of the covariates. One of the reasons for the practice is the presence of missing data. This talk shows how to apply the full-information maximum likelihood (FIML) implemented in structural equation modeling to handle the missing covariates in a mixed-effects meta-analysis.