Contribution ID: **286** Type: **Oral Presentation**

Correcting for publication bias in multivariate and multilevel meta-analysis: A multivariate step function selection model approach

Wednesday 23 July 2025 11:15 (15 minutes)

Univariate meta-analysis models assume that all effect sizes included in the meta-analysis are independent. This assumption is violated if, for example, two outcomes are reported in a study that are of interest to the meta-analyst or a study reports multiple experiments administered by the same researchers in the same lab. The multivariate and multilevel meta-analysis model allow to model dependent effect sizes and these models have recently gained in popularity among meta-analysts in psychology.

One of the largest threats to multivariate and multilevel meta-analysis is publication bias, but there are currently no methods available that correct for publication bias in these models. Selection model approaches are nowadays frequently used to correct for publication bias in a meta-analysis. In this presentation, we extend the univariate step function selection model approach to multivariate and multilevel meta-analysis. We propose a strict and more relaxed selection model that assigns a different publication probability to studies that have only statistically significant outcomes or at least one significant outcome.

We illustrate how the multivariate step function selection model approach can be used in a sensitivity analysis by applying it to the data of a published multivariate and multilevel meta-analysis. Two simulation studies tailored to these two applications show that the multivariate step function selection model approach outperforms the multivariate and multilevel meta-analysis model that do not correct for publication bias. We conclude this presentation with offering guidance for applying the proposed method in practice and discussing limitations of the method as well as opportunities for future development.

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Session Classification: Symposium : ”Recent Developments in Meta-Analysis”