Workshop Meta-analysis for Diverse Study-designs

Rebecca Kuiper
Leonard Vanbrabant
Eli Clapper

Utrecht University
The Netherlands

The hallmark of social and behavioral science is replication: for the science to be robust, research must be replicated. Two types of replications can be distinguished: i) exact replications, which use homogeneous study-designs, meaning that the operationalization (and therewith the number) of variables and the statistical model are the same as in the original study; and ii) **conceptual replications, with heterogeneous/diverse study-designs**. Exact replication can be feasible for experimental research, which offers a high degree of experimenter control, but may be hard to publish because of a presumed lack of originality. For other research types, like observational studies, exact replication is virtually impossible, and such studies will use conceptual replications. In conceptual replications, *the central theory/hypothesis is the main characteristic*. Conceptual replications are precious: If support for the same hypothesis is found irrespective of how a theory is studied, this strengthens the confidence in conclusions. Hence, conceptual replications serve as a robustness check (comparable to 'triangulation' in sociology).

Evaluating hypotheses is ubiquitous in the behavioral, social, and biomedical sciences. To obtain evidence in favor of the hypothesis of interest, model selection methods can be used. Moreover, there exist (information-theoretical and Bayesian) model selection techniques that can **evaluate *informative, theory-based hypotheses***, such that theories regarding ordering of parameters can be examined. For example, whether medicine A works better (e.g., leads to more happiness) than medicine B, which works better than a placebo (in an ANOVA model: $\mu_A > \mu_B > \mu_{Placebo}$); or: number of children is a stronger predictor for happiness than income and age (in a regression model with standardized parameters: $\beta_{NoC} > \{\beta_{Inc}, \beta_{age}\}$). Two information-theoretical model selection criteria that can evaluate such hypotheses are the AIC-type criteria called GORIC and the GORICA. These render evidence/support for the hypotheses of interest.

If multiple studies, irrespective of their study design, examine the same central hypothesis, its evidence/support obtained in all these studies can be aggregated. Such method is referred to as combining evidence, evidence synthesis, or **aggregating evidence**, which can be seen as a meta-analysis for studies using diverse study-designs.

After this workshop, you know how to conduct meta-analysis on diverse study-designs using evidence aggregation. We start off by introducing the AIC-type criterion GORIC and its approximation the GORICA.

The workshop itself comprises lectures and hands-on parts (using R and/or a Shiny app).
Please bring your laptop (possibly with R and Rstudio installed on it).
Notably, while no prior experience with R is assumed, some familiarity with R would be very useful.