# Methods

## Measures of host-symbiont phylogenetic congruence

## Data collection

* missing data?? - IMPORTANT to mention - I do not thik

## Meta-analysis

We used *p* values obtained from randomaization tests that are implemented in ‘TreeMap’ and ‘Parafit’ as measures of incongrace. These *p* values were converted into *r* and its transformation *Zr*. We can caculate *requivalent* via *t* values with *df* = *N* - 2 values from *p* values (one-tailed) (Rosenthal and Rubin 2003) and then, also obtain *Zr*equivalent from *r*equivalent, as follows:

where *N* is sample size and, in our case, the sum of the numbers of host and symobiont species included in a randomaixation test.

All statstical analyses were conducted using R versino 3.5.2 (R Core Team 2018). We used multilevel (random-effects) meta-analytic and meta-regression models (Nakagawa and Santos 2012) becuase multiple effect sizes were obtained from some studies (i.e., study IDs were included as a random factor in the models to account for non-indepedence). All meta-analytic models were implemented using the function, *rma.mv* in the R pacakge, *metafor* version 2.0-0 (Viechtbauer 2010). All model specifications and model selection procedures are found in our elecotronic supplmentary materials (ESM)

## Publication bias and sensitivity analysis

We used

* egger regression with the full model - say reason why
* trancations due to the number of simulations……
* boundaries due to N (randomization tests) is creating
* sensitivity analysis - two jusntificaitons
  1. why we put TreeMap and Parafit data
  2. Trancations are not biasing our main results!!!
  + simulaiton numbers are not different between parasites and mutulists

## Reference

Nakagawa, Shinichi, and Eduardo SA Santos. 2012. “Methodological Issues and Advances in Biological Meta-Analysis.” *Evolutionary Ecology* 26 (5). Springer: 1253–74.

R Core Team. 2018. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.

Rosenthal, Robert, and Donald B Rubin. 2003. “Requivalent: A Simple Effect Size Indicator.” *Psychological Methods* 8 (4). American Psychological Association: 492.

Viechtbauer, Wolfgang. 2010. “Conducting Meta-Analyses in R with the metafor Package.” *Journal of Statistical Software* 36 (3): 1–48. <http://www.jstatsoft.org/v36/i03/>.