joinmeta - controlling the type-1 error in multiverse meta-analysis

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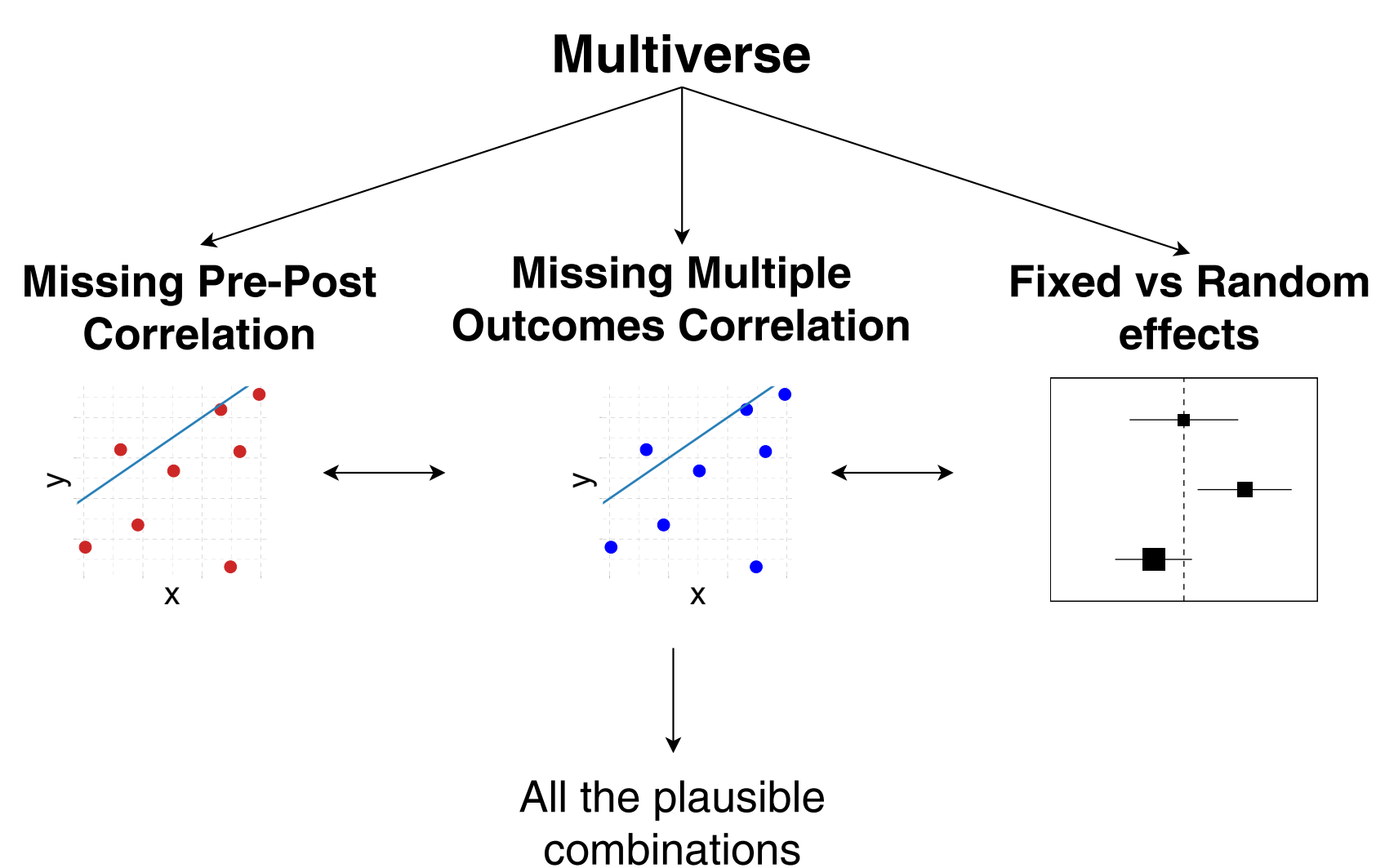
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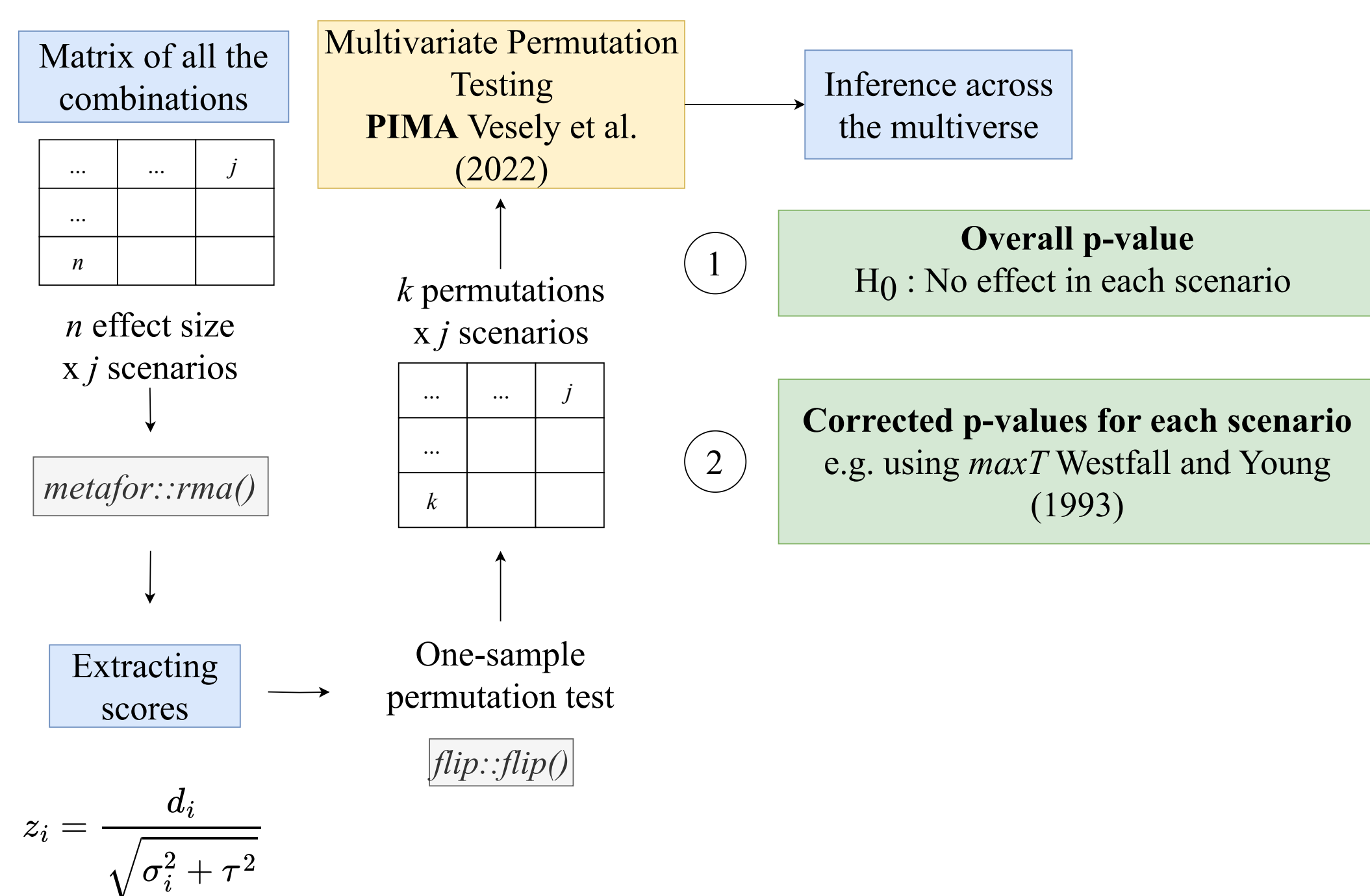[3] Department of Statistics, University of Padova

The Multiverse problem

As example, we used the dataset by Daros et al. (2021) with a multivariate meta-analysis of RCTs designs with multiple measure for the same outcome. **We considered a total of 162 plausible scenarios**.

The Proposed Workflow


$$z_i = \frac{d_i}{\sqrt{\sigma_i^2 + \tau^2}}$$

We **simulated a plausible multiverse** sampling from a multivariate normal distribution with a vector of means (i.e., the meta-analysis results) and a variance-covariance matrix for the relationship between different scenarios.
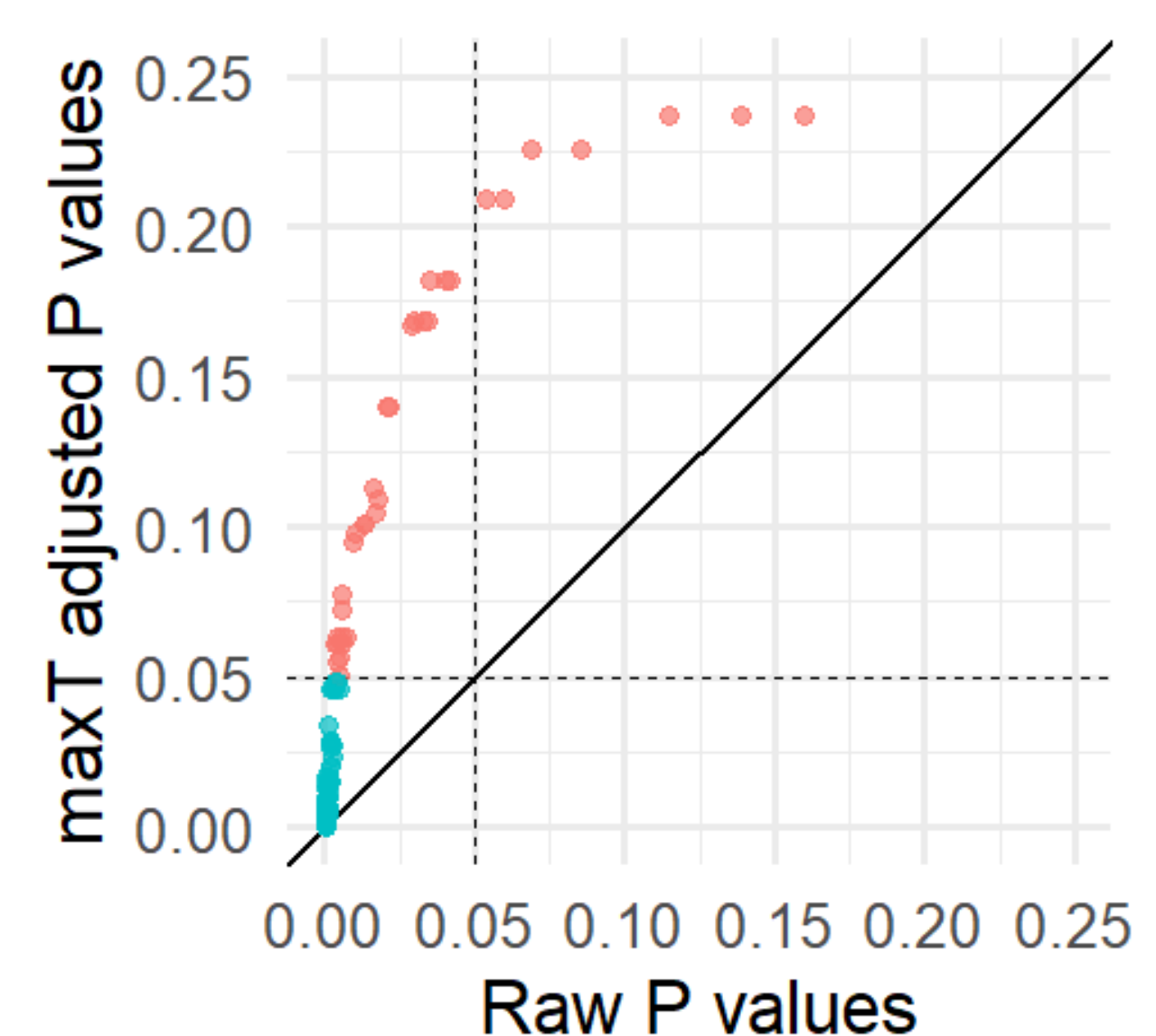
Multiverse Summary

The multiverse is a associated with an **overall p-value** < 0.001, an **average effect of** 0.403 ($SD = 0.112$) and an **average correlation of** 0.620 ($SD = 0.102$).
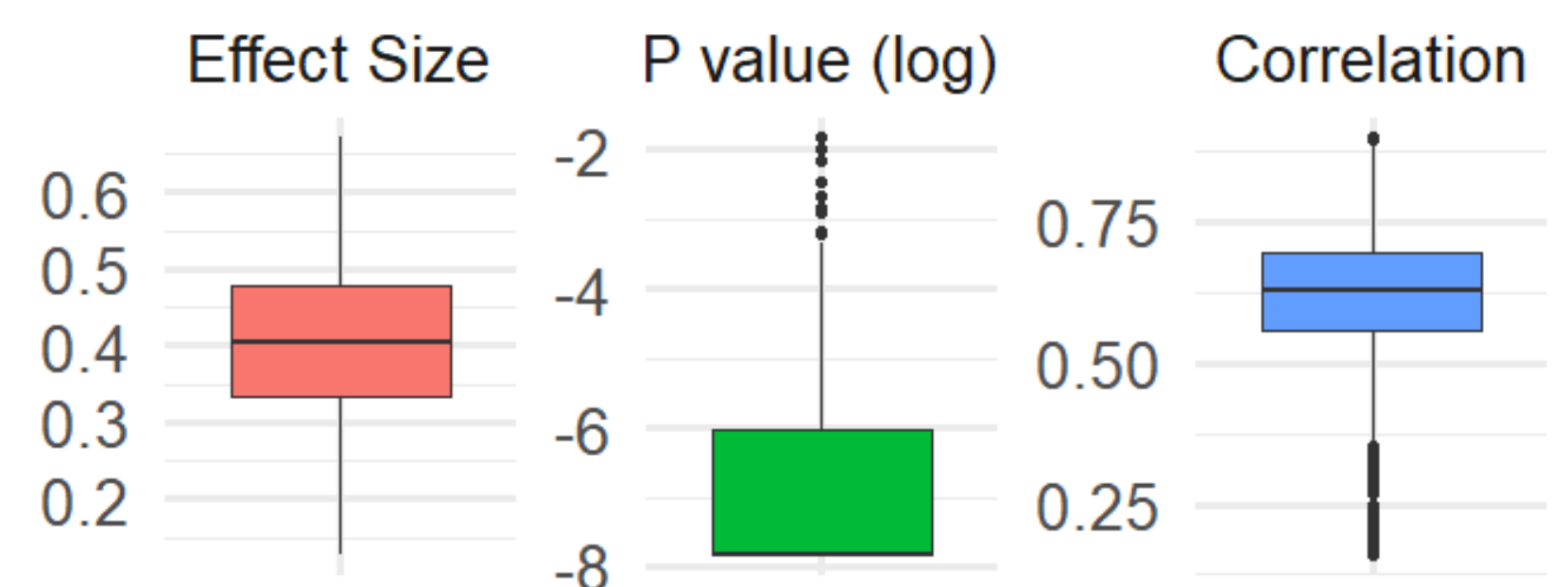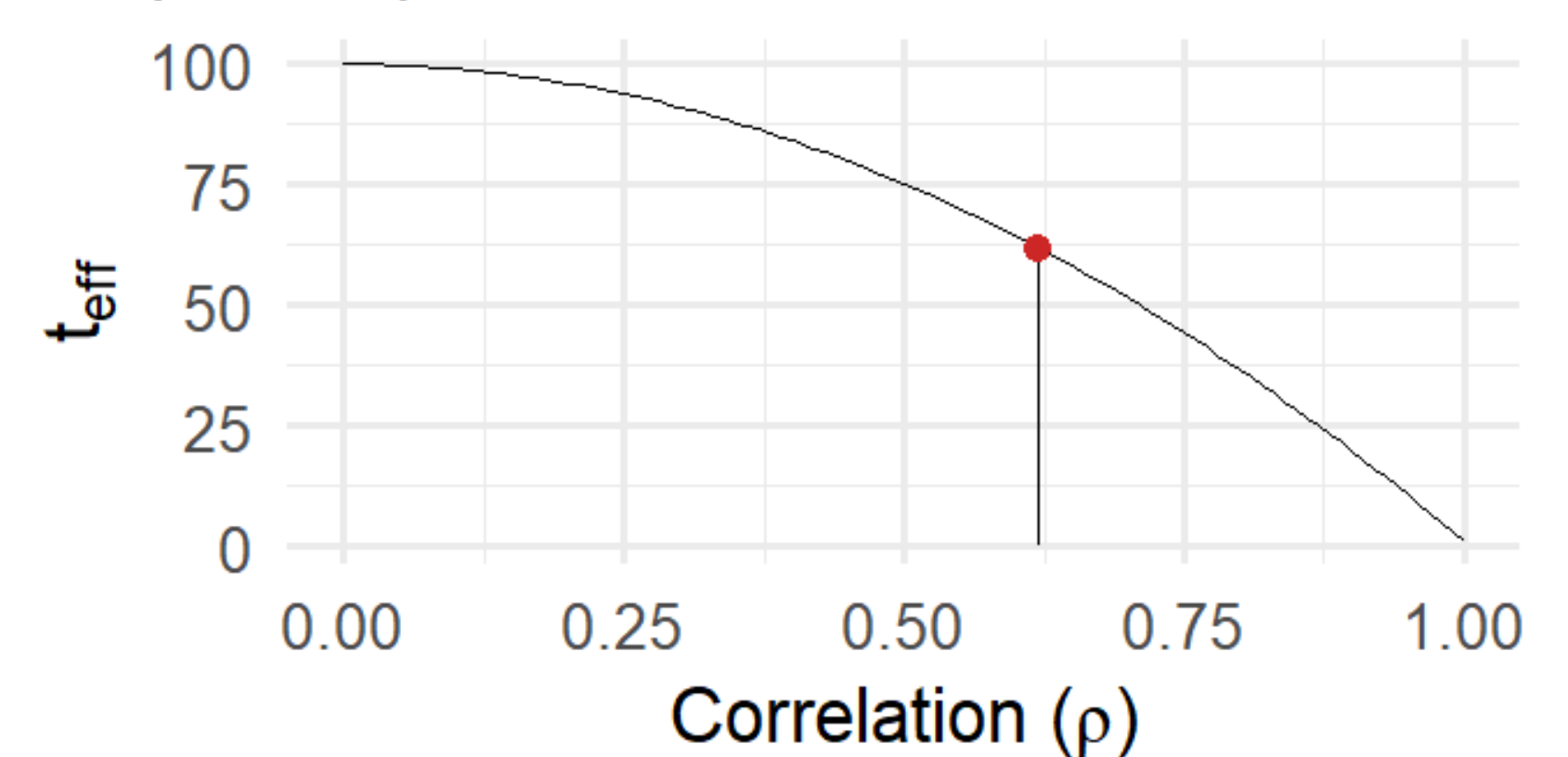
Multiverse post-hoc p-values

Conclusions and Next Steps

- **Corrected p-values for valid post-hoc inference** on specific scenarios
- The method **control the Family-wise Error Rate (FWER)** across the multiverse
- **Fast meta-analysis via permutations** using the `flip` package
- Implementing multilevel and multivariate meta-analysis