Tutorial on the R package ReplicationSuccess

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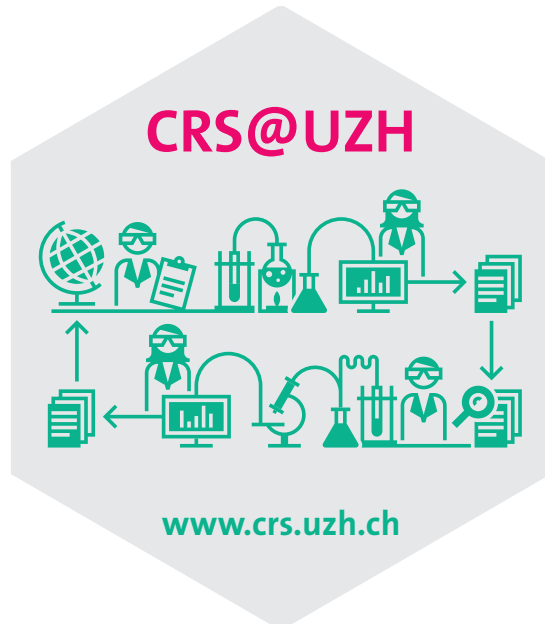

22.01.2020

Installation

- Linux / Windows

```
install.packages(pkgs = "ReplicationSuccess",
                 repos ="http://R-Forge.R-project.org")
```

- Mac

```
install.packages(pkgs = "ReplicationSuccess",
                 repos = "http://R-Forge.R-project.org",
                 type = "source")
```

Replication studies

Direct replication

- Repeating original study using the same methodology

$\rightarrow$ Tool to assess credibility of scientific discoveries

$\rightarrow$ Regulatory requirement

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Replication crisis

- Low replicability of many scientific discoveries

$\rightarrow$ Increased interest in meta-science

$\rightarrow$ Large-scale replication projects

Large-scale replication projects

– 2015: Reproducibility project psychology

Large-scale replication projects

- 2015: Reproducibility project psychology
- 2016: Experimental economics replication project

Large-scale replication projects

- 2015: Reproducibility project psychology
- 2016: Experimental economics replication project
- 2018: Experimental philosophy replicability project

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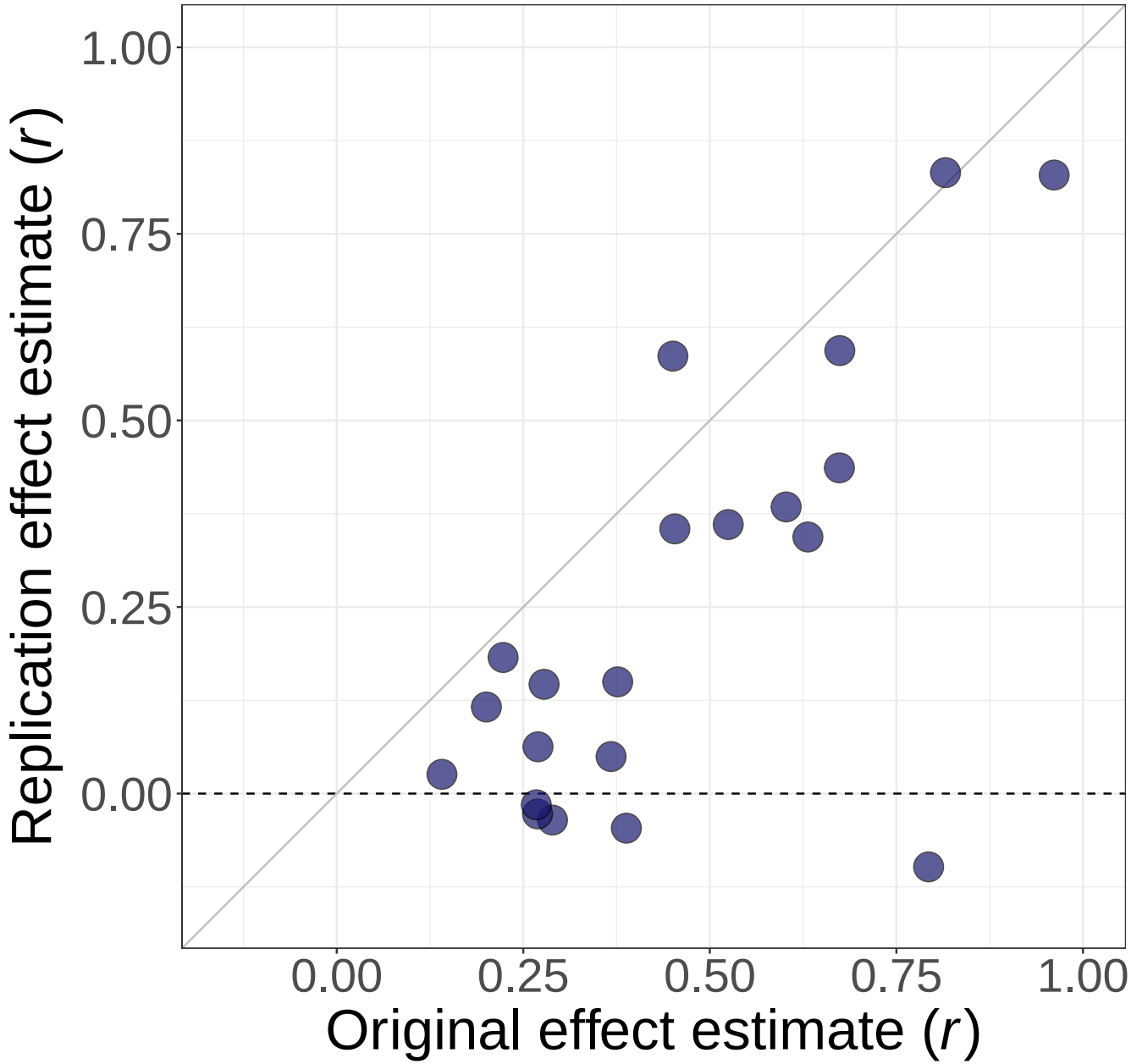
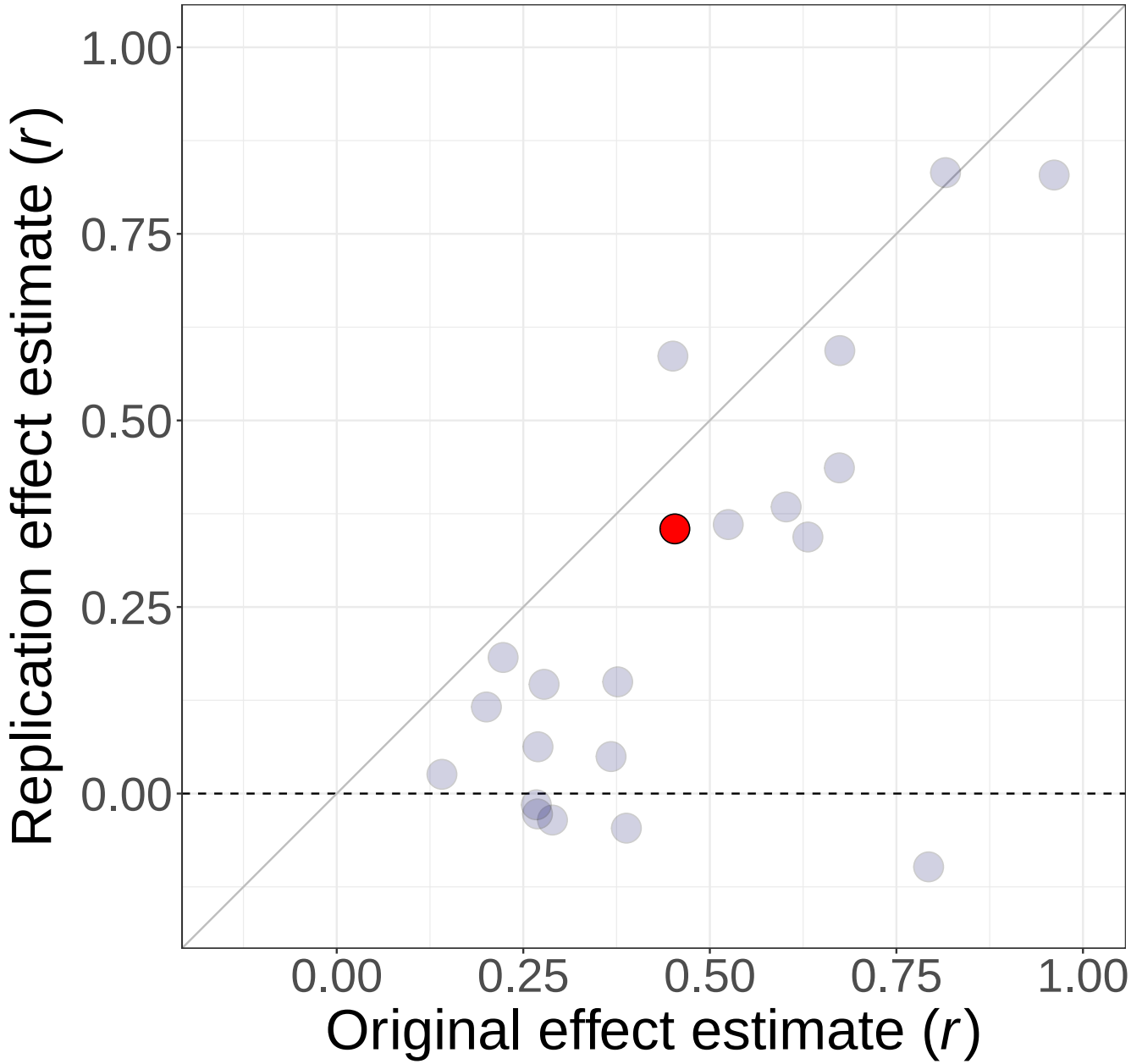
Social sciences replication project



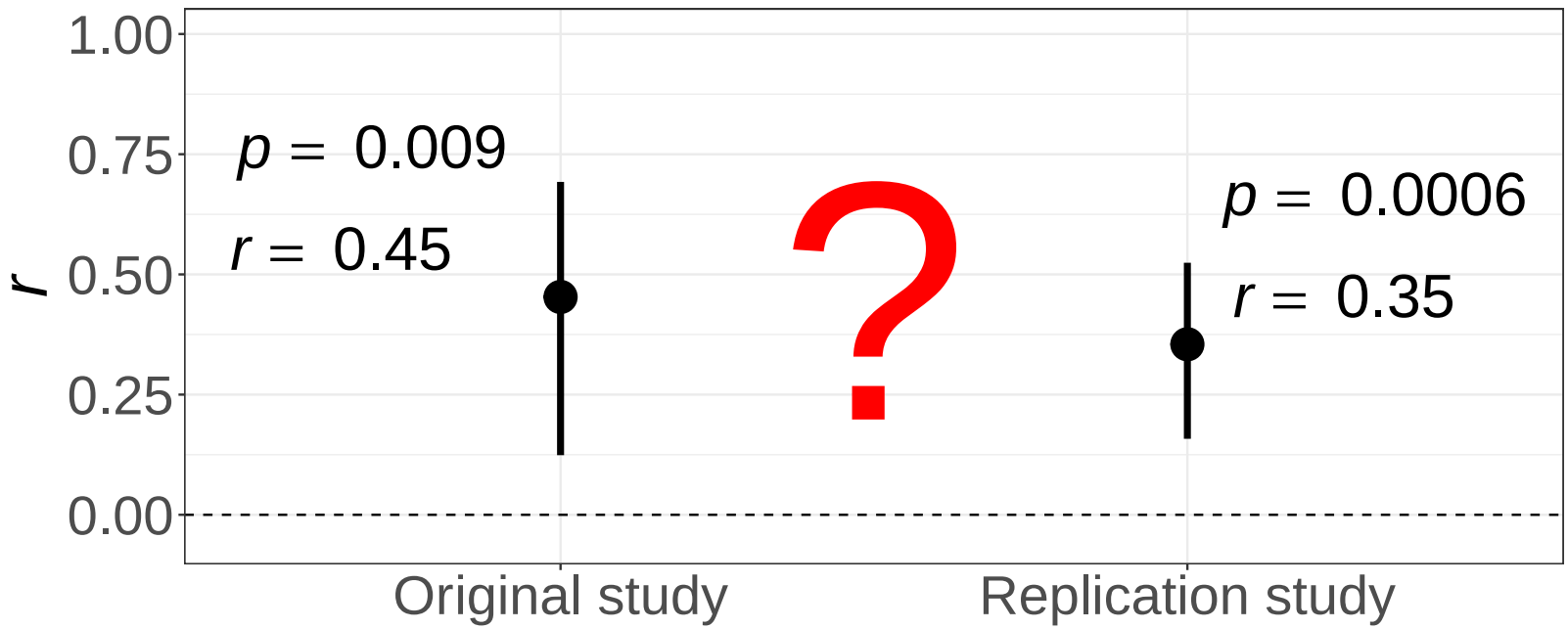
Social sciences replication project



Morewedge et al. (2010). Science

Original discovery

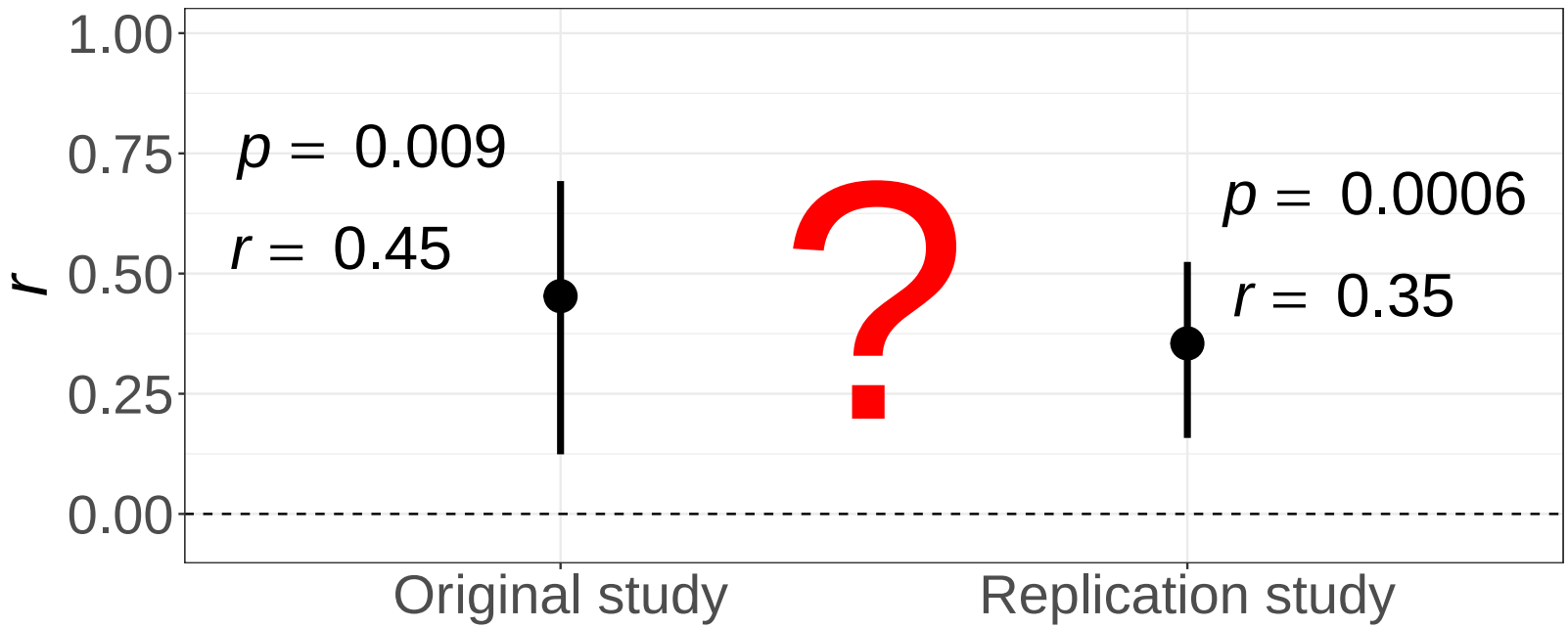
"Repeatedly imagining eating a food subsequently reduces the actual consumption of that food"



When is a replication successful?

Some proposed criteria for replication success

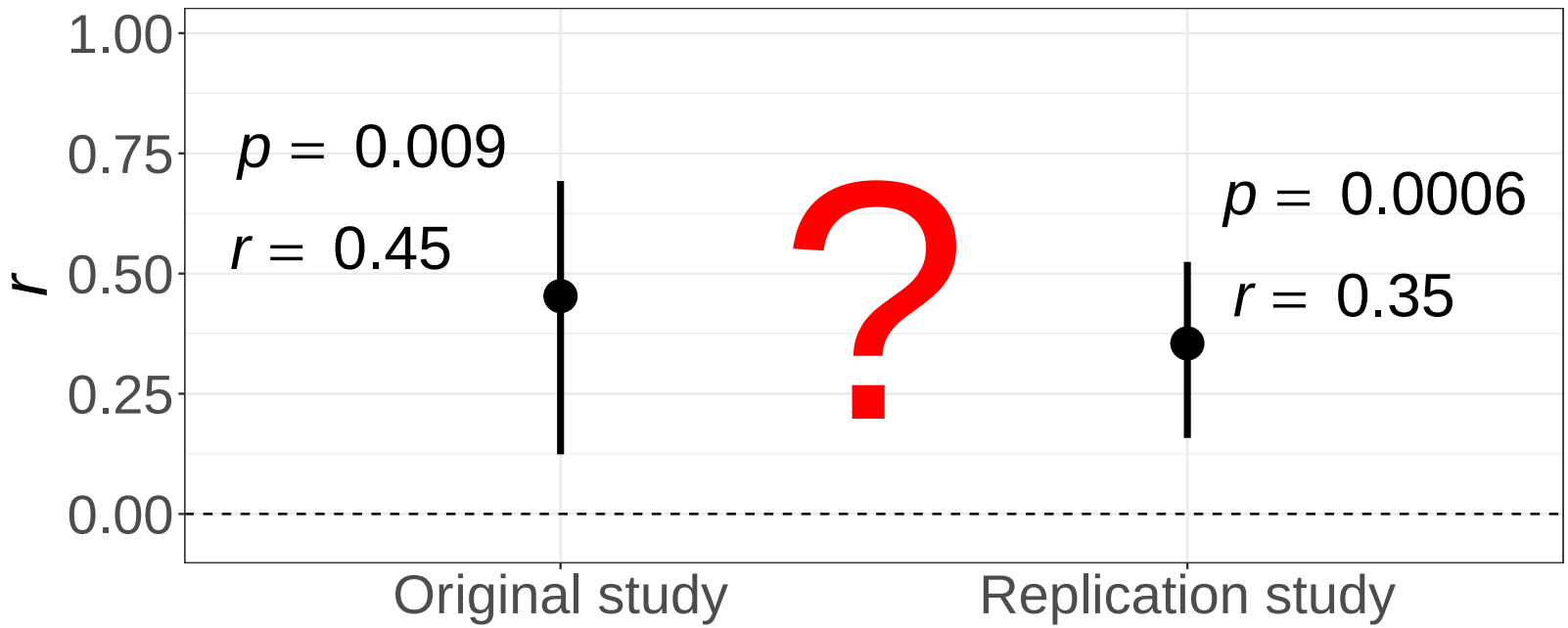
1. Statistical significance



When is a replication successful?

Some proposed criteria for replication success

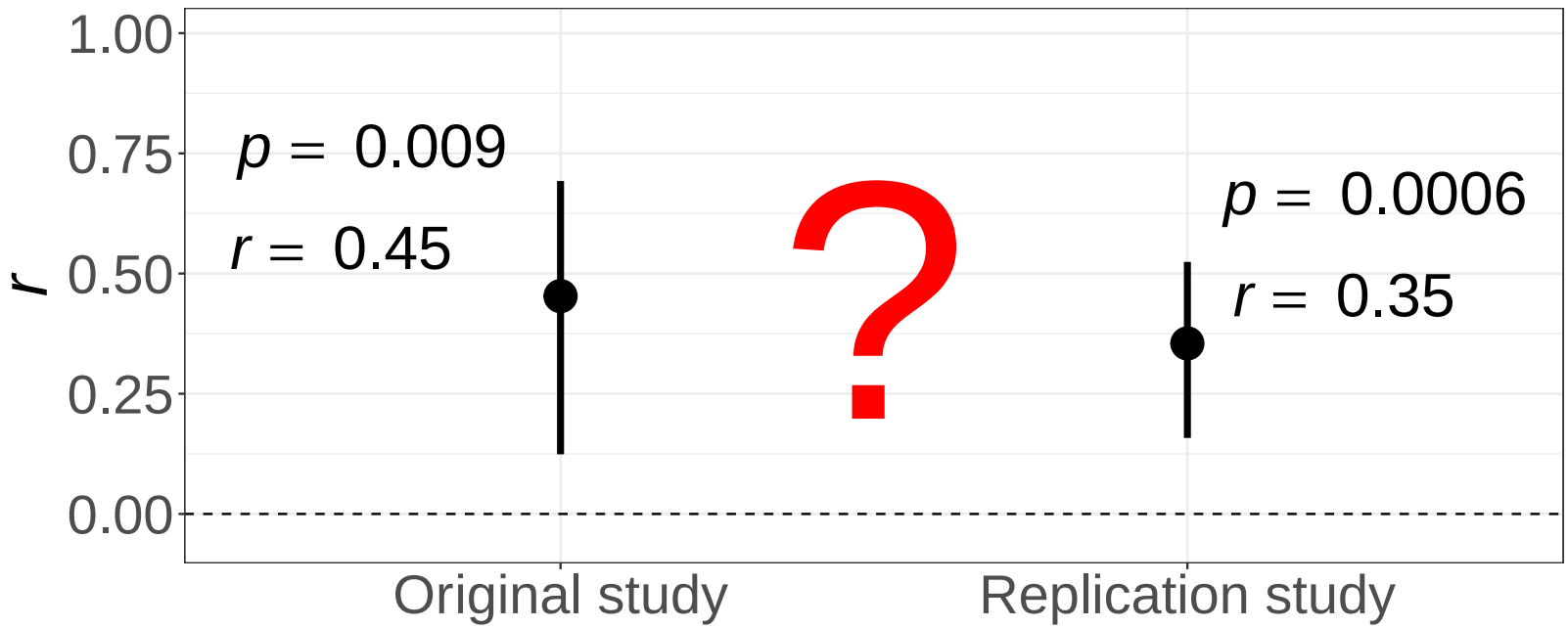
1. Statistical significance
2. Comparison of effect estimates



When is a replication successful?

Some proposed criteria for replication success

1. Statistical significance
2. Comparison of effect estimates
3. Reverse Bayes methods



Drawbacks of approaches

- Signficiance can always be achieved by increasing sample size
- Estimates can be compatible but uninformative

Design of replication studies

– Discuss sample size calculation important and depends on analysis strategy – Discuss what was done in projects – Ad hoc shrinkage

Statistical framework of package

– normality assumption – relative quantities – DesignPrior: Predictive and conditional

Significance

– powerSignficance + arguments – sampleSizeSignificance + arguments – exercises

Comparison of effect size

– predictionInterval – sampleSizePI – sampleSizePIwidth

Reverse Bayes

– pSceptical – powerReplicationSuccess – sampleSizeReplicationSuccess

Outlook

– Interim – Heterogeneity – EB shrinkage

References

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