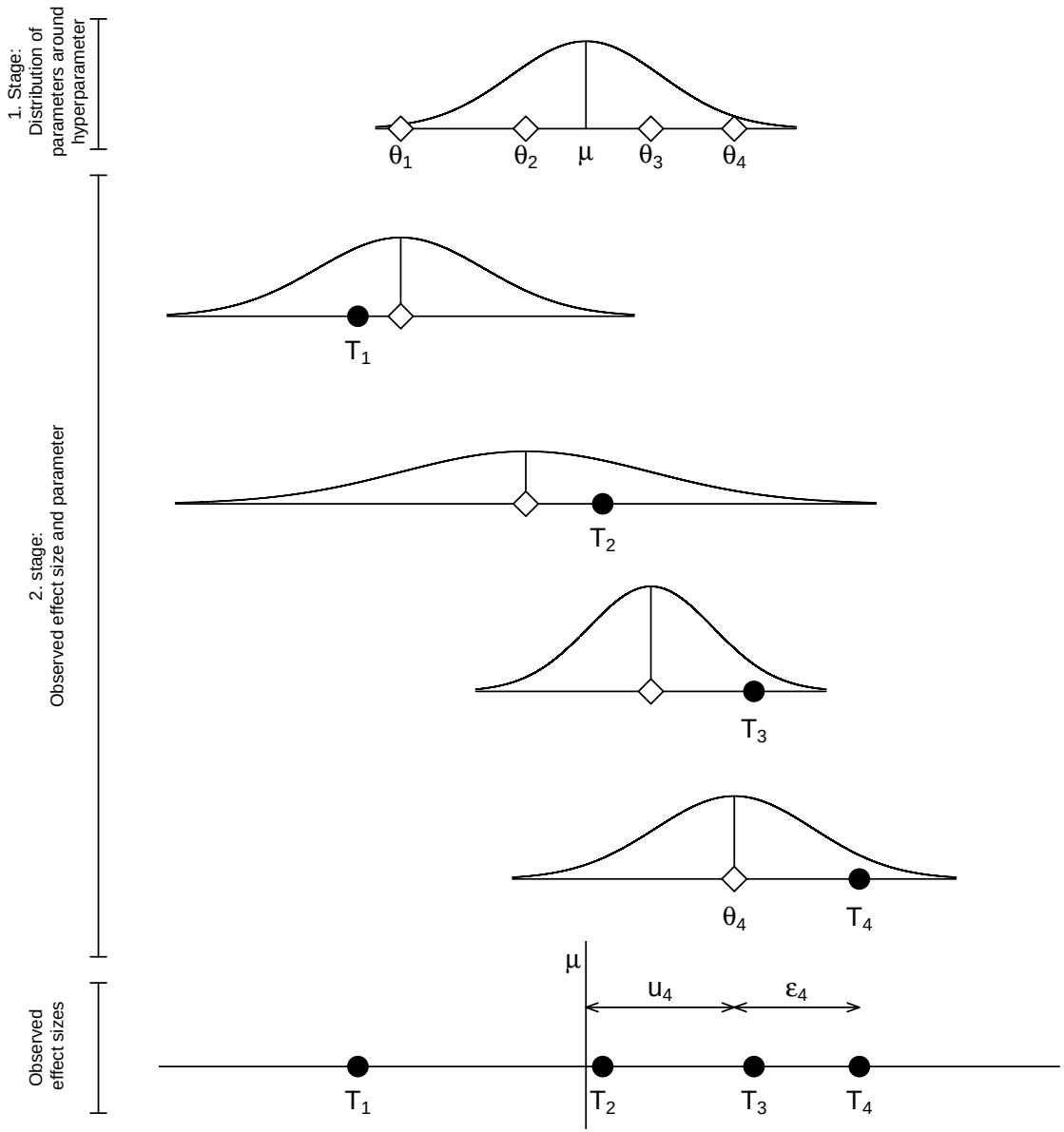
Schematic diagram of the REM



Random-effects model

- The random-effects model acknowledges two sources of variation:
  1. within-study sampling error (σ_i^2) and
  2. between-studies variability (τ^2) (e.g., due to varying study characteristics).

  The random-effects model can be represented as

$$T_i = \overbrace{\mu + u_i}^{\theta_i} + e_i, \tag{1}$$

- where
  - e_i is the differences between the true mean θ_i for study i and the observed mean effect size T_i for study i ($e_i = T_i - \theta_i$) and
  - u_i is the difference between the grand mean μ and the true mean for ith study θ_i ($u_i = \theta_i - \mu$).
- $e_i \sim N(0, \sigma_i^2)$
- $u_i \sim N(0, \tau^2)$

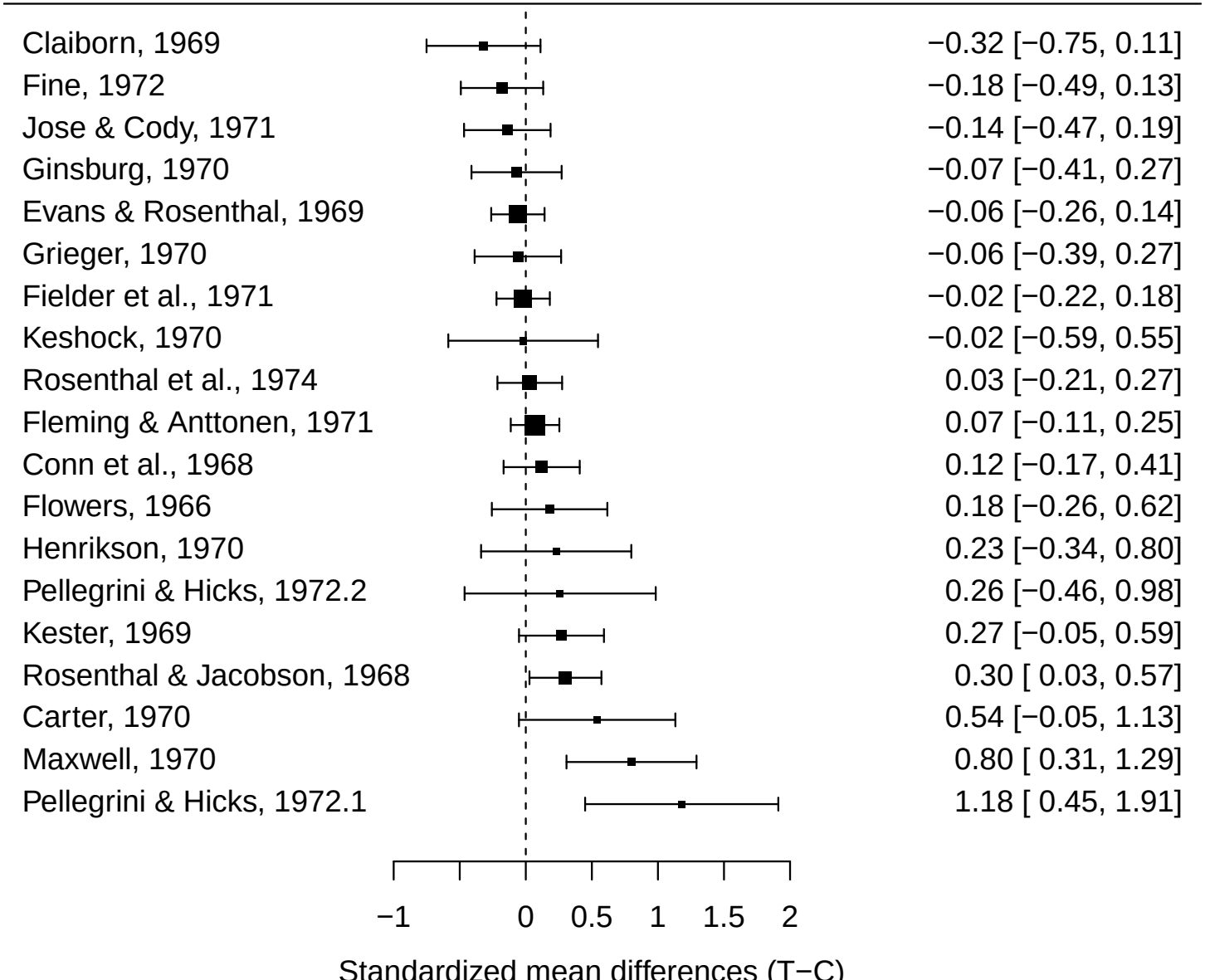
Random-effects model

- Under random-effects model we have two goals:
  - To estimate the mean population effect size from which the observed studies are sample from.
  - To estimate the between-studies variability (τ^2).
- Although in practice we compute σ_i^2, we treat the within-study error variance as known.
- Thus, under random-effects model the variance of T_i is equal to $\sigma_i^2 + \tau^2$.

```
library(metafor)

## Loading required package: Matrix
## Loading 'metafor' package (version 2.0-0). For an
overview
## and introduction to the package please type:
help(metafor).
##
## Attaching package: 'metafor'
## The following objects are masked from
'package:meta':
##
##     baujat, forest, funnel, funnel.default, labbe,
radial,
##     trimfill
```

Example


Claiborn, 1969 −0.32 [−0.75, 0.11]
Fine, 1972 −0.18 [−0.49, 0.13]
Jose & Cody, 1971 −0.14 [−0.47, 0.19]
Ginsburg, 1970 −0.07 [−0.41, 0.27]
Evans & Rosenthal, 1969 −0.06 [−0.26, 0.14]
Grieger, 1970 −0.06 [−0.39, 0.27]
Fielder et al., 1971 −0.02 [−0.22, 0.18]
Keshock, 1970 −0.02 [−0.59, 0.55]
Rosenthal et al., 1974 0.03 [−0.21, 0.27]
Fleming & Anttonen, 1971 0.07 [−0.11, 0.25]
Conn et al., 1968 0.12 [−0.17, 0.41]
Flowers, 1966 0.18 [−0.26, 0.62]
Henrikson, 1970 0.23 [−0.34, 0.80]
Pellegrini & Hicks, 1972.2 0.26 [−0.46, 0.98]
Kester, 1969 0.27 [−0.05, 0.59]
Rosenthal & Jacobson, 1968 0.30 [0.03, 0.57]
Carter, 1970 0.54 [−0.05, 1.13]
Maxwell, 1970 0.80 [0.31, 1.29]
Pellegrini & Hicks, 1972.1 1.18 [0.45, 1.91]
−1
0
0.5
1
1.5
2
Standardized mean differences (T−C)