Package ‘POMADE’

February 13, 2024

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Description  Provides functions to compute and plot power levels, minimum detectable effect sizes, and minimum required sample sizes for the test of the overall average effect size in meta-analysis of dependent effect sizes.
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cluster_bias_adjustment

**Cluster Bias Correction**

**Description**

Function to conduct cluster bias correction of sampling variance estimates obtained from cluster-randomized studies in which the reported variance does not account for clustering.

**Usage**

```r
cluster_bias_adjustment(sigma2js, cluster_size = 22, icc = 0.2)
```

**Arguments**

- `sigma2js` A vector of sampling variance estimates that do not account for clustering.
- `cluster_size` A numerical value for average cluster size.
- `icc` Assumed intra-class correlation (proportion of total variance at the cluster level).

**Value**

Returns a vector of cluster bias adjusted variance estimates

**Examples**

```r
cbc_var <- cluster_bias_adjustment(
  sigma2js = c(0.04, 0.06, 0.08, 0.1),
  cluster_size = 15,
  icc = 0.15
)
cbc_var
```
effective_sample_sizes

Approximate Effective Sample Sizes

Description

Approximate Effective Sample Sizes

Usage

effective_sample_sizes(
  sample_sizes_raw = NULL,
  Nt_raw = NULL,
  Nc_raw = NULL,
  cluster_size = 22,
  icc = 0.22
)

Arguments

  sample_sizes_raw       Vector of the raw total study sample size(s).
  Nt_raw                Vector of raw treatment group sample size(s).
  Nc_raw                Vector of raw control group sample size(s).
  cluster_size          Average cluster size (Default = 22, a common class size in education research studies).
  icc                   Assumed intra-class correlation (Default = 0.22, the average ICC value in Hedges & Hedberg (2007) unconditional models)

Details

  N_j/DE

Value

A vector of effective sample sizes, adjusted for cluster-dependence.

Examples

  sample_sizes <- sample(50:1000, 50, replace = TRUE)
  effective_sample_sizes(
    sample_sizes_raw = sample_sizes,
    cluster_size = 20,
    icc = 0.15
  )
**mdes_MADE**

*Minimum Detectable Effect Size (MDES) for Meta-Analysis With Dependent Effect Sizes*

**Description**

Compute the minimum detectable effect size in a meta-analysis of dependent effect size estimates, given a specified number of studies, power level, estimation method, and further assumptions about the distribution of studies.

**Usage**

```r
mdes_MADE(
  J,  # Number of studies. Can be one value or a vector of multiple values.
  tau,  # Between-study SD. Can be one value or a vector of multiple values.
  omega,  # Within-study SD. Can be one value or a vector of multiple values.
  rho,  # Correlation coefficient between effect size estimates from the same study. Can be one value or a vector of multiple values.
  alpha = 0.05,  # Level of statistical significance. Can be one value or a vector of multiple values. Default is 0.05.
  target_power = 0.8,  # Numerical value specifying the target power level. Can be one value or a vector of multiple values.
  d = 0,  # Contrast value. Can be one value or a vector of multiple values. Default is 0.
  model = "CHE",  # Estimation method. Can be one of "CHE", "RVE", or "CWE".
  var_df = "RVE",  # Variance distribution. Can be one of "RVE", "RVEW", "RVEW_nested", or NULL.
  sigma2_dist = NULL,  # Distribution of sigma^2. Can be one of "N" (normal), "T" (t-distribution), or NULL.
  n_ES_dist = NULL,  # Distribution of effect size. Can be one of "N" (normal), "T" (t-distribution), or NULL.
  iterations = 100,  # Number of iterations for computing MDES. Default is 100.
  seed = NULL,  # Random seed. Can be one of NULL, 0, or a vector of multiple values.
  warning = TRUE,  # Whether to print warnings. Can be one of TRUE or FALSE. Default is TRUE.
  upper = 2,  # Upper limit for computing MDES. Can be one of NULL, 0, 1, or a vector of multiple values.
  show_lower = FALSE  # Whether to print lower bound. Can be one of TRUE or FALSE. Default is FALSE.
)
```

**Arguments**

- **J**: Number of studies. Can be one value or a vector of multiple values.
- **tau**: Between-study SD. Can be one value or a vector of multiple values.
- **omega**: Within-study SD. Can be one value or a vector of multiple values.
- **rho**: Correlation coefficient between effect size estimates from the same study. Can be one value or a vector of multiple values.
- **alpha**: Level of statistical significance. Can be one value or a vector of multiple values. Default is 0.05.
- **target_power**: Numerical value specifying the target power level. Can be one value or a vector of multiple values.
- **d**: Contrast value. Can be one value or a vector of multiple values. Default is 0.
model  
Assumed working model for dependent effect sizes, either "CHE" for the correlated-and-hierarchical effects model, "CE" for the correlated effects model, or "MLMA" for the multi-level meta-analysis model. Default is "CHE". Can be one value or a vector of multiple values.

var_df  
Indicates the technique used to obtain the sampling variance of the average effect size estimate and the degrees of freedom, either "Model" for model-based variance estimator with degrees of freedom of J - 1, "Satt" for model-based variance estimator with Satterthwaite degrees of freedom, or "RVE" for robust variance estimator with Satterthwaite degrees of freedom. Default is "RVE". Can be one value or a vector of multiple values.

sigma2_dist  
Distribution of sampling variance estimates from each study. Can be either a single value, a vector of plausible values, or a function that generates random values.

n_ES_dist  
Distribution of the number of effect sizes per study. Can be either a single value, a vector of plausible values, or a function that generates random values.

iterations  
Number of iterations per condition (default is 100).

seed  
Numerical value for a seed to ensure reproducibility of the iterated power approximations.

warning  
Logical indicating whether to return a warning when either sigma2_dist or n_ES_dist is based on balanced assumptions.

upper  
Numerical value containing the upper bound of the interval to be searched for the MDES.

show_lower  
Logical value indicating whether to report lower bound of the interval searched for the MDES. Default is FALSE.

Value  
Returns a tibble with information about the expectation of the number of studies, the between-study and within-study variance components, the sample correlation, the contrast effect, the level of statistical significance, the target power value(s), the minimum detectable effect size, the number of iterations, the model to handle dependent effect sizes, and the methods used to obtain sampling variance estimates as well as the number effect sizes per study.

Examples

```R
mdes_MADE(
  J = 30,
  tau = 0.05,
  omega = 0.02,
  rho = 0.2,
  model = "CHE",
  var_df = "RVE",
  sigma2_dist = 4 / 100,
  n_ES_dist = 6,
  seed = 10052510
)
```
min_studies_MADE  Finding the Number of Studies Needed to Obtain a Certain Amount of Power

Description

Compute the minimum number of studies needed to obtain a specified power level in a meta-analysis of dependent effect size estimates, given an effect size of practical concern, estimation method, and further assumptions about the distribution of studies.

Usage

```r
min_studies_MADE(
  mu,
  tau,
  omega,
  rho,
  alpha = 0.05,
  target_power = 0.8,
  d = 0,
  model = "CHE",
  var_df = "RVE",
  sigma2_dist = NULL,
  n_ES_dist = NULL,
  iterations = 100,
  seed = NULL,
  warning = TRUE,
  upper = 100,
  show_lower = FALSE
)
```

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mu</td>
<td>Effect size of practical concern. Can be one value or a vector of multiple values.</td>
</tr>
<tr>
<td>tau</td>
<td>Between-study SD. Can be one value or a vector of multiple values.</td>
</tr>
<tr>
<td>omega</td>
<td>Within-study SD. Can be one value or a vector of multiple values.</td>
</tr>
<tr>
<td>rho</td>
<td>Correlation coefficient between effect size estimates from the same study. Can be one value or a vector of multiple values.</td>
</tr>
<tr>
<td>alpha</td>
<td>Level of statistical significance. Can be one value or a vector of multiple values. Default is 0.5.</td>
</tr>
<tr>
<td>target_power</td>
<td>Numerical value specifying the target power level. Can be one value or a vector of multiple values.</td>
</tr>
<tr>
<td>d</td>
<td>Contrast value. Can be one value or a vector of multiple values. Default is 0.</td>
</tr>
</tbody>
</table>
**min_studies_MADE**

- **model**
  Assumed working model for dependent effect sizes, either "CHE" for the correlated-and-hierarchical effects model, "CE" for the correlated effects model, or "MLMA" for the multi-level meta-analysis model. Default is "CHE". Can be one value or a vector of multiple values.

- **var_df**
  Indicates the technique used to obtain the sampling variance of the average effect size estimate and the degrees of freedom, either "Model" for model-based variance estimator with degrees of freedom of J - 1, "Satt" for model-based variance estimator with Satterthwaite degrees of freedom, or "RVE" for robust variance estimator with Satterthwaite degrees of freedom. Default is "RVE". Can be one value or a vector of multiple values.

- **sigma2_dist**
  Distribution of sampling variance estimates from each study. Can be either a single value, a vector of plausible values, or a function that generates random values.

- **n_ES_dist**
  Distribution of the number of effect sizes per study. Can be either a single value, a vector of plausible values, or a function that generates random values.

- **iterations**
  Number of iterations per condition (default is 100).

- **seed**
  Numerical value for a seed to ensure reproducibility of the iterated power approximations.

- **warning**
  Logical indicating whether to return a warning when either sigma2_dist or n_ES_dist is based on balanced assumptions.

- **upper**
  Numerical value containing the upper bound of the interval to be searched for the minimum number of studies.

- **show_lower**
  Logical value indicating whether to report lower bound of the interval searched for the minimum number of studies. Default is FALSE.

---

**Value**

Returns a tibble with information about the expectation of the effect size of practical concern, the between-study and within-study variance components, the sample correlation, the contrast effect, the level of statistical significance, the target power value(s), the number of studies needed, the number of iterations, the model to handle dependent effect sizes, and the methods used to obtain sampling variance estimates as well as the number effect sizes per study.

**Examples**

```r
min_studies_MADE(
  mu = 0.3,
  tau = 0.05,
  omega = 0.01,
  rho = 0.2,
  target_power = .7,
  alpha = 0.05,
  model = "CE",
  var_df = "RVE",
  sigma2_dist = 4 / 200,
  n_ES_dist = 5.5,
  seed = 10052510
)```

```
plot_MADE

Generic plot function for 'MADE' objects

Description
Create a faceted plot displaying the results of a set of power analyses. This is a generic function to make facet_grid plots, with specific methods defined for power_MADE, mdes_MADE, and min_studies_MADE objects.

Usage
plot_MADE(
  data,
  v_lines,
  legend_position,
  color,
  numbers,
  number_size,
  numbers_ynudge,
  caption,
  x_lab,
  x_breaks,
  x_limits,
  y_breaks,
  y_limits,
  y_expand = NULL,
  warning,
  traffic_light_assumptions,
  ...
)

Arguments
- **data**: Data/object for which the plot should be made.
- **v_lines**: Integer or vector to specify vertical line(s) in within each plot. Default is NULL.
- **legend_position**: Character string to specify position of legend. Default is "bottom".
- **color**: Logical indicating whether to use color in the plot(s). Default is TRUE.
- **numbers**: Logical indicating whether to number the plots. Default is TRUE.
- **number_size**: Integer value specifying the size of the (optional) plot numbers. Default is 2.5.
- **numbers_ynudge**: Integer value for vertical nudge of the (optional) plot numbers.
caption Logical indicating whether to include a caption with detailed information regarding the analysis. Default is TRUE.

x_lab Title for the x-axis. If NULL (the default), the x_lab is specified automatically.

x_breaks Optional vector to specify breaks on the x-axis. Default is NULL.

x_limits Optional vector of length 2 to specify the limits of the x-axis. Default is NULL, which allows limits to be determined automatically from the data.

y_breaks Optional vector to specify breaks on the y-axis.

y_limits Optional vector of length 2 to specify the limits of the y-axis.

y_expand Optional vector to expand the limits of the y-axis. Default is NULL.

warning Logical indicating whether warnings should be returned when multiple models appear in the data. Default is TRUE.

traffic_light_assumptions Optional logical to specify coloring of strips of the facet grids to emphasize assumptions about the likelihood the given analytical scenario. See Vembye, Pustejovsky, & Pigott (In preparation) for further details.

... Additional arguments available for some classes of objects.

Value A ggplot object

References


See Also

plot_MADE.power, plot_MADE.mdes, plot_MADE.min_studies

Examples

```r
power_dat <-
  power_MADE(
    J = c(50, 56),
    mu = 0.15,
    tau = 0.1,
    omega = 0.05,
    rho = 0,
    sigma2_dist = 4 / 200,
    n_ES_dist = 6
  )

power_example <-
  plot_MADE(
    data = power_dat,
    power_min = 0.8,
    ...)
expected_studies = c(52, 54),
warning = FALSE,
caption = TRUE,
color = TRUE,
model_comparison = FALSE,
numbers = FALSE
)

power_example

plot_MADE.mdes

---

**Description**

Creates a faceted plot for minimum detectable effect size (mdes) analyses calculated using mdes_MADE.

**Usage**

```r
## S3 method for class 'mdes'
plot_MADE(
data,
v_lines = NULL,
legend_position = "bottom",
color = TRUE,
numbers = TRUE,
number_size = 2.5,
numbers_ynudge = NULL,
caption = TRUE,
x_lab = NULL,
x_breaks = NULL,
x_limits = NULL,
y_breaks = ggplot2::waiver(),
y_limits = NULL,
y_expand = NULL,
warning = TRUE,
traffic_light_assumptions = NULL,
es_min = NULL,
expected_studies = NULL,
...
)
```

**Arguments**

data Data/object for which the plot should be made.
v_lines Integer or vector to specify vertical line(s) in within each plot. Default is NULL.
plot_MADE.mdes

legend_position
Character string to specify position of legend. Default is "bottom".

color
Logical indicating whether to use color in the plot(s). Default is TRUE.

numbers
Logical indicating whether to number the plots. Default is TRUE.

number_size
Integer value specifying the size of the (optional) plot numbers. Default is 2.5.

numbers_ynudge
Integer value for vertical nudge of the (optional) plot numbers.

caption
Logical indicating whether to include a caption with detailed information regarding the analysis. Default is TRUE.

x_lab
Title for the x-axis. If NULL (the default), the x_lab is specified automatically.

x_breaks
Optional vector to specify breaks on the x-axis. Default is NULL.

x_limits
Optional vector of length 2 to specify the limits of the x-axis. Default is NULL, which allows limits to be determined automatically from the data.

y_breaks
Optional vector to specify breaks on the y-axis.

y_limits
Optional vector of length 2 to specify the limits of the y-axis.

y_expand
Optional vector to expand the limits of the y-axis. Default is NULL.

warning
Logical indicating whether warnings should be returned when multiple models appear in the data. Default is TRUE.

traffic_light_assumptions
Optional logical to specify coloring of strips of the facet grids to emphasize assumptions about the likelihood the given analytical scenario. See Vembye, Pustejovsky, & Pigott (In preparation) for further details.

es_min
Optional integer or vector to specify a horizontal line or interval, indicating a benchmark value or values for the minimum effect size of practical concern (default is NULL).

expected_studies
Optional vector of length 2 specifying a range for the number of studies one expects to include in the meta-analysis. If specified, this interval will be shaded across facet_grip plots (default is NULL).

...
Additional arguments available for some classes of objects.

Details
In general, it can be rather difficult to guess/approximate the true model parameters and sample characteristics a priori. Calculating the minimum detectable effect size under just a single set of assumptions can easily be misleading even if the true model and data structure only slightly diverge from the yielded data and model assumptions. To maximize the informativeness of the analysis, Vembye, Pustejovsky, & Pigott (In preparation) suggest accommodating the uncertainty of the power approximations by reporting or plotting minimum detectable effect size estimates across a range of possible scenarios, which can be done using plot_MADE.mdes.

Value
A ggplot plot showing the minimum detectable effect size across the expected number of studies, faceted by the between-study and within-study SDs, with different colors, lines, and shapes corresponding to different values of the assumed sample correlation.
References
meta-analysis of dependent effect sizes: Common guidelines and an introduction to the POMADE
R package.

See Also
plot_MADE

Examples
mdes_MADE(
  J = c(25, 35),
  tau = 0.05,
  omega = 0,
  rho = 0,
  target_power = .6,
  alpha = 0.1,
  sigma2_dist = 4 / 200,
  n_ES_dist = 8,
  seed = 10052510
)
|>
plot_MADE(expected_studies = c(28, 32), numbers = FALSE)
plot_MADE.min_studies

x_breaks = NULL,
x_limits = NULL,
y_breaks = ggplot2::waiver(),
y_limits = NULL,
y_expand = NULL,
warning = TRUE,
traffic_light_assumptions = NULL,
v_shade = NULL,
h_lines = NULL,
...
)

Arguments

data Data/object for which the plot should be made.
v_lines Integer or vector to specify vertical line(s) in within each plot. Default is NULL.
legend_position Character string to specify position of legend. Default is "bottom".
color Logical indicating whether to use color in the plot(s). Default is TRUE.
numbers Logical indicating whether to number the plots. Default is TRUE.
number_size Integer value specifying the size of the (optional) plot numbers. Default is 2.5.
numbers_y_nudge Integer value for vertical nudge of the (optional) plot numbers.
caption Logical indicating whether to include a caption with detailed information regarding the analysis. Default is TRUE.
x_lab Title for the x-axis. If NULL (the default), the x_lab is specified automatically.
x_breaks Optional vector to specify breaks on the x-axis. Default is NULL.
x_limits Optional vector of length 2 to specify the limits of the x-axis. Default is NULL, which allows limits to be determined automatically from the data.
y_breaks Optional vector to specify breaks on the y-axis.
y_limits Optional vector of length 2 to specify the limits of the y-axis.
y_expand Optional vector to expand the limits of the y-axis. Default is NULL.
warning Logical indicating whether warnings should be returned when multiple models appear in the data. Default is TRUE.
traffic_light_assumptions Optional logical to specify coloring of strips of the facet grids to emphasize assumptions about the likelihood the given analytical scenario. See Vembye, Pustejovsky, & Pigott (In preparation) for further details.
v_shade Optional vector of length 2 specifying the range of the x-axis interval to be shaded in each plot.
h_lines Optional integer or vector specifying horizontal lines on each plot.
...
Additional arguments available for some classes of objects.
Details

In general, it can be rather difficult to guess/approximate the true model parameters and sample characteristics a priori. Calculating the minimum number of studies needed under just a single set of assumptions can easily be misleading even if the true model and data structure only slightly diverge from the yielded data and model assumptions. To maximize the informativeness of the analysis, Vembye, Pustejovsky, & Pigott (In preparation) suggest accommodating the uncertainty of the power approximations by reporting or plotting power estimates across a range of possible scenarios, which can be done using plot_MADE.power.

Value

A ggplot plot showing the minimum number of studies needed to obtain a given effect size with a certain amount of power and level-alpha, faceted across levels of the within-study SD and the between-study SD, with different colors, lines, and shapes corresponding to different values of the assumed sample correlation. If length(unique(data$mu)) > 1, it returns a ggplot plot showing the minimum studies needed to obtained a given effect size with a certain amount of power and level-alpha across effect sizes of practical concern, faceted by the between-study and within-study SDs, with different colors, lines, and shapes corresponding to different values of the assumed sample correlation.

References


See Also

plot_MADE

Examples

```r
min_studies_MADE(
  mu = c(0.25, 0.35),
  tau = 0.05,
  omega = 0.02,
  rho = 0.2,
  target_power = .7,
  sigma2_dist = 4 / 200,
  n_ES_dist = 6,
  seed = 10052510
) |> plot_MADE(y_breaks = seq(0, 10, 2), numbers = FALSE)
```
plot_MADE.power

Plot function for a 'power' object

Description

Creates a faceted plot or plots for power analyses conducted with power_MADE.

Usage

```r
## S3 method for class 'power'
plot_MADE(
  data,
  v_lines = NULL,
  legend_position = "bottom",
  color = TRUE,
  numbers = TRUE,
  number_size = 2.5,
  numbers_ynudge = 0,
  caption = TRUE,
  x_lab = NULL,
  x_breaks = NULL,
  x_limits = NULL,
  y_breaks = seq(0, 1, 0.2),
  y_limits = c(0, 1),
  y_expand = NULL,
  warning = TRUE,
  traffic_light_assumptions = NULL,
  power_min = NULL,
  expected_studies = NULL,
  model_comparison = FALSE,
  ...
)
```

Arguments

data: Data/object for which the plot should be made.
v_lines: Integer or vector to specify vertical line(s) in within each plot. Default is NULL.
legend_position: Character string to specify position of legend. Default is "bottom".
color: Logical indicating whether to use color in the plot(s). Default is TRUE.
numbers: Logical indicating whether to number the plots. Default is TRUE.
number_size: Integer value specifying the size of the (optional) plot numbers. Default is 2.5.
numbers_ynudge: Integer value for vertical nudge of the (optional) plot numbers.
caption: Logical indicating whether to include a caption with detailed information regarding the analysis. Default is TRUE.
### plot_MADE.power

**x_lab**  
Title for the x-axis. If NULL (the default), the x_lab is specified automatically.

**x_breaks**  
Optional vector to specify breaks on the x-axis. Default is NULL.

**x_limits**  
Optional vector of length 2 to specify the limits of the x-axis. Default is NULL, which allows limits to be determined automatically from the data.

**y_breaks**  
Optional vector to specify breaks on the y-axis.

**y_limits**  
Optional vector of length 2 to specify the limits of the y-axis.

**y_expand**  
Optional vector to expand the limits of the y-axis. Default is NULL.

**warning**  
Logical indicating whether warnings should be returned when multiple models appear in the data. Default is TRUE.

**traffic_light_assumptions**  
Optional logical to specify coloring of strips of the facet grids to emphasize assumptions about the likelihood the given analytical scenario. See Vembye, Pustejovsky, & Pigott (In preparation) for further details.

**power_min**  
Either an integer specify a horizontal line or a length-2 vector to specify an interval, indicating a benchmark level of power (default is NULL).

**expected_studies**  
Optional vector of length 2 specifying a range for the number of studies one expects to include in the meta-analysis. If specified, this interval will be shaded across facet_grids plots (default is NULL).

**model_comparison**  
Logical indicating whether power estimates should be plotted across different working models for dependent effect size estimates (default is FALSE) instead of across values for the sampling correlation.

...  
Additional arguments available for some classes of objects.

### Details

In general, it can be rather difficult to guess/approximate the true model parameters and sample characteristics a priori. Calculating power under only a single set of assumptions can easily be misleading even if the true model and data structure only slightly diverge from the yielded data and model assumptions. To maximize the informativeness of the power approximations, Vembye, Pustejovsky, & Pigott (In preparation) suggest accommodating the uncertainty of the power approximations by reporting or plotting power estimates across a range of possible scenarios, which can be done using plot_MADE.power.

### Value

A ggplot plot showing power across the expected number of studies, faceted by the between-study and within-study SDs, with different colors, lines, and shapes corresponding to different values of the assumed sample correlation. If model_comparison = TRUE, it returns a ggplot plot showing power across the expected number of studies, faceted by the between-study and within-study SDs, with different colors, lines, and shapes corresponding to different working models for dependent effect size estimates.
power_MADE

References


See Also

plot_MADE

Examples

```r
power_dat <-
  power_MADE(
    J = c(50, 56),
    mu = 0.15,
    tau = 0.1,
    omega = 0.05,
    rho = 0,
    sigma2_dist = 4 / 200,
    n_ES_dist = 6
  )

power_example <-
  plot_MADE(
    data = power_dat,
    power_min = 0.8,
    expected_studies = c(52, 54),
    warning = FALSE,
    caption = TRUE,
    color = TRUE,
    model_comparison = FALSE,
    numbers = FALSE
  )

power_example
```

---

power_MADE: Power Approximation for Overall Average Effects in Meta-Analysis WithDependent Effect Sizes

Description

Compute power of the test of the overall average effect size in a meta-analysis of dependent effect size estimates, given a specified number of studies, effect size of practical concern, estimation method, and further assumptions about the distribution of studies.
Usage

code
```r
power_MADE(
  J,  # Number of studies. Can be one value or a vector of multiple values.
  mu,  # Effect size of practical concern. Can be one value or a vector of multiple values.
  tau,  # Between-study SD. Can be one value or a vector of multiple values.
  omega,  # Within-study SD. Can be one value or a vector of multiple values.
  rho,  # Correlation coefficient between effect size estimates from the same study. Can be one value or a vector of multiple values.
  alpha = 0.05,  # Level of statistical significance. Can be one value or a vector of multiple values. Default is 0.05.
  d = 0,  # Contrast value. Can be one value or a vector of multiple values. Default is 0.
  model = "CHE",  # Assumed working model for dependent effect sizes, either "CHE" for the correlated-and-hierarchical effects model, "CE" for the correlated effects model, or "MLMA" for the multi-level meta-analysis model. Default is "CHE". Can be one value or a vector of multiple values.
  var_df = "RVE",  # Indicates the technique used to obtain the sampling variance of the average effect size estimate and the degrees of freedom, either "Model" for model-based variance estimator with degrees of freedom of J - 1, "Satt" for model-based variance estimator with Satterthwaite degrees of freedom, or "RVE" for robust variance estimator with Satterthwaite degrees of freedom. Default is "RVE". Can be one value or a vector of multiple values.
  sigma2_dist = NULL,  # Distribution of sampling variance estimates from each study. Can be either a single value, a vector of plausible values, or a function that generates random values.
  n_ES_dist = NULL,  # Distribution of the number of effect sizes per study. Can be either a single value, a vector of plausible values, or a function that generates random values.
  iterations = 100,  # Number of iterations. Default is 100.
  seed = NULL,  # Seed for random number generation. Default is NULL.
  warning = TRUE,  # Whether to display warning messages. Default is TRUE.
  average_power = TRUE  # Whether to calculate average power. Default is TRUE.
)
```

Arguments

- **J**: Number of studies. Can be one value or a vector of multiple values.
- **mu**: Effect size of practical concern. Can be one value or a vector of multiple values.
- **tau**: Between-study SD. Can be one value or a vector of multiple values.
- **omega**: Within-study SD. Can be one value or a vector of multiple values.
- **rho**: Correlation coefficient between effect size estimates from the same study. Can be one value or a vector of multiple values.
- **alpha**: Level of statistical significance. Can be one value or a vector of multiple values. Default is 0.05.
- **d**: Contrast value. Can be one value or a vector of multiple values. Default is 0.
- **model**: Assumed working model for dependent effect sizes, either "CHE" for the correlated-and-hierarchical effects model, "CE" for the correlated effects model, or "MLMA" for the multi-level meta-analysis model. Default is "CHE". Can be one value or a vector of multiple values.
- **var_df**: Indicates the technique used to obtain the sampling variance of the average effect size estimate and the degrees of freedom, either "Model" for model-based variance estimator with degrees of freedom of J - 1, "Satt" for model-based variance estimator with Satterthwaite degrees of freedom, or "RVE" for robust variance estimator with Satterthwaite degrees of freedom. Default is "RVE". Can be one value or a vector of multiple values.
- **sigma2_dist**: Distribution of sampling variance estimates from each study. Can be either a single value, a vector of plausible values, or a function that generates random values.
- **n_ES_dist**: Distribution of the number of effect sizes per study. Can be either a single value, a vector of plausible values, or a function that generates random values.
power_MADE

iterations  Number of iterations per condition (default is 100).

seed  Numerical value for a seed to ensure reproducibility of the iterated power approximations.

warning  Logical indicating whether to return a warning when either sigma2_dist or n_ES_dist is based on balanced assumptions.

average_power  Logical indicating whether to calculate average power across the iterations for each condition.

Details

Find all background material behind the power approximations in Vembye, Pustejovsky, & Pigott (2022), including arguments for why it is suggested neither to conduct power analysis based on balanced assumptions about the number of effects per study and the study variance nor to use the original power approximation assuming independence among effect sizes (Hedges & Pigott, 2001).

Value

Returns a tibble with information about the expectation of the number of studies, the effect size of practical concern, the between-study and within-study variance components, the sample correlation, the contrast effect, the level of statistical significance, the sampling variance of overall average effect size of practical concern, the degrees of freedom, the power, the mcse, the number of iterations, the model to handle dependent effect sizes, and the methods used to obtain sampling variance estimates as well as the number effect sizes per study.

References


Examples

```r
power <- power_MADE(
  J = c(40, 60),
  mu = 0.2,
  tau = 0.2,
  omega = 0.1,
  rho = 0.7,
  sigma2_dist = \(x\) rgamma(x, shape = 5, rate = 10),
  n_ES_dist = \(x\) 1 + stats::rpois(x, 5.5 - 1),
  model = c("CHE", "MLMA", "CE"),
  var_df = c("Model", "Satt", "RVE"),
  alpha = .05,
  seed = 10052510,
  iterations = 5
)
```
Description

Rough approximation of the between-study variance based on assumption about the typical sample size of studies included in the synthesis.

Usage

```r
tau2_approximation(sample_size = 100, es, df_minus2 = TRUE)
```

Arguments

- `sample_size`: Typical sample size of studies
- `es`: Smallest effect size of practical concern
- `df_minus2`: If degrees of freedom should be df-2 or just df

Value

A tibble with small, medium, and large magnitudes of tau2

Examples

```r
tau2_approximation(
  sample_size = 50,
  es = 0.1,
  df_minus2 = TRUE
)
```
Description

Data from a meta-analysis on the effects of collaborative models of instruction on student achievement from Vembye, Weiss, and Bhat (2023).

Usage

VWB23_pilot

Format

A tibble with 76 rows/studies and 9 variables

study_year  Study author and year of publication
studyid     Unique study ID
esid        Unique effect size ID
kj           Number of effect sizes per study
N_meanj      Average sample size of study
Nt_meanj     Average sample size of treatment group within study
Nc_meanj     Average sample size of control group within study
ESS_meanj    Roughly approximated effective sample sizes
vg_ms_mean   Average cluster bias corrected sampling variance estimates

Source

Find background material on Vembye’s OSF page, and the preprint at https://osf.io/preprints/metaarxiv/mq5v7/.

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