

Package ‘metapower’

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Type Package

Title Power Analysis for Meta-Analysis

Version 0.2.2

Description

A simple and effective tool for computing and visualizing statistical power for meta-analysis, including power analysis of main effects (Jackson & Turner, 2017)<[doi:10.1002/jrsm.1240](https://doi.org/10.1002/jrsm.1240)>, test of homogeneity (Pigott, 2012)<[doi:10.1007/978-1-4614-2278-5](https://doi.org/10.1007/978-1-4614-2278-5)>, subgroup analysis, and categorical moderator analysis (Hedges & Pigott, 2004)<[doi:10.1037/1082-989X.9.4.426](https://doi.org/10.1037/1082-989X.9.4.426)>.

Depends R (>= 3.6)

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Imports cowplot (>= 1.0.0), dplyr (>= 0.8.5), ggplot2 (>= 3.3.0),
knitr (>= 1.28), magrittr (>= 1.5), tidyr (>= 1.0.2), testthat
(>= 2.3.2), rlang (>= 0.4.5)

Suggests rmarkdown (>= 2.1)

VignetteBuilder knitr

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homogen_power	<i>Compute Power for Test of Homogeneity in Meta-analysis</i>
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Description

Compute statistical power for the Test of Homogeneity for meta-analysis under both fixed- and random-effects models.

Usage

```
homogen_power(  
  effect_size,  
  study_size,  
  k,  
  i2,  
  es_type,  
  p = 0.05,  
  con_table = NULL  
)
```

Arguments

effect_size	Numerical value of effect size.
study_size	Numerical value for number number of participants (per study).
k	Numerical value for total number of studies.
i2	Numerical value for Heterogeneity estimate (i^2).
es_type	'Character reflecting effect size metric: 'r', 'd', or 'or'.
p	Numerical value for significance level (Type I error probability).
con_table	(Optional) Numerical values for 2x2 contingency table as a vector in the following format: c(a,b,c,d).

2x2 Table	Group 1	Group 2
Present	a	b
Not Present	c	d

Value

Estimated Power to detect differences in homogeneity of effect sizes for fixed- and random-effects models

References

- Borenstein, M., Hedges, L. V., Higgins, J. P. T. and Rothstein, H. R. (2009). Introduction to meta-analysis, Chichester, UK: Wiley.
- Hedges, L., Pigott, T. (2004). The Power of Statistical Tests for Moderators in Meta-Analysis, Psychological Methods, 9(4), 426-445. doi: <https://dx.doi.org/10.1037/1082-989x.9.4.426>
- Pigott, T. (2012). Advances in Meta-Analysis. doi: <https://dx.doi.org/10.1007/978-1-4614-2278-5>

See Also

https://jason-griffin.shinyapps.io/shiny_metapower/

Examples

```
homogen_power(effect_size = .5, study_size = 10, k = 10, i2 = .50, es_type = "d")
```

mod_power

Compute Power for Categorical Moderator Analysis in Meta-analysis

Description

Computes statistical power for categorical moderator analysis under fixed and random effects models.

Usage

```
mod_power(
  n_groups,
  effect_sizes,
  study_size,
  k,
  i2,
  es_type,
  p = 0.05,
  con_table = NULL
)
```

Arguments

n_groups	Numerical value for the levels of a categorical variable.
effect_sizes	Numerical values for effect sizes of for each group.
study_size	Numerical value for number of participants (per study).
k	Numerical value for total number of studies.
i2	Numerical value for Heterogeneity estimate (i^2).
es_type	Character reflecting effect size metric: 'r', 'd', or 'or'.

p Numerical value for significance level (Type I error probability).

con_table (Optional) List of numerical values for 2x2 contingency tables as a vector in the following format: c(a,b,c,d). These should be specified for each group(i.e., n_groups).

2x2 Table	Group 1	Group 2
Present	a	b
Not Present	c	d

Value

Estimated Power estimates for moderator analysis under fixed- and random-effects models

See Also

https://jason-griffin.shinyapps.io/shiny_metapower/

Examples

```
mod_power(n_groups = 2,
          effect_sizes = c(.1,.5),
          study_size = 20,
          k = 10,
          i2 = .50,
          es_type = "d")
mod_power(n_groups = 2,
          con_table = list(g1 = c(6,5,4,5), g2 = c(8,5,2,5)),
          study_size = 40,
          k = 20,
          i2 = .50,
          es_type = "or")
```

mpower	<i>Compute Power for Meta-analysis</i>
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Description

Computes statistical power for summary effect sizes in meta-analysis.

Usage

```
mpower(
  effect_size,
  study_size,
  k,
  i2,
```

```

    es_type,
    test_type = "two-tailed",
    p = 0.05,
    con_table = NULL
  )

```

Arguments

<code>effect_size</code>	Numerical value of effect size.
<code>study_size</code>	Numerical value for number number of participants (per study).
<code>k</code>	Numerical value for total number of studies.
<code>i2</code>	Numerical value for Heterogeneity estimate (i^2).
<code>es_type</code>	Character reflecting effect size metric: 'r', 'd', or 'or'.
<code>test_type</code>	Character value reflecting test type: ("two-tailed" or "one-tailed").
<code>p</code>	Numerical value for significance level (Type I error probability).
<code>con_table</code>	(Optional) Numerical values for 2x2 contingency table as a vector in the following format: c(a,b,c,d).

2x2 Table	Group 1	Group 2
Present	a	b
Not Present	c	d

Value

Estimated Power

References

Borenstein, M., Hedges, L. V., Higgins, J. P. T. and Rothstein, H. R.(2009). Introduction to meta-analysis, Chichester, UK: Wiley.

Hedges, L., Pigott, T. (2004). The Power of Statistical Tests for Moderators in Meta-Analysis, *Psychological Methods*, 9(4), 426-445 doi: <https://dx.doi.org/10.1037/1082-989x.9.4.426>

Pigott, T. (2012). *Advances in Meta-Analysis*. doi: <https://dx.doi.org/10.1007/978-1-4614-2278-5>

Jackson, D., Turner, R. (2017). Power analysis for random-effects meta-analysis, *Research Synthesis Methods*, 8(3), 290-302 doi: <https://dx.doi.org/10.1002/jrsm.1240>

See Also

https://jason-griffin.shinyapps.io/shiny_metapower/

Examples

```
mpower(effect_size = .2, study_size = 10, k = 10, i2 = .5, es_type = "d")
```

plot_homogen_power	<i>Plot Power Curve for Test of Homogeneity</i>
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Description

Plots power curves for the test of homogeneity for different levels of within-study variation for fixed effects models. For random-effects models, power curves are plotted for various levels of heterogeneity.

Usage

```
plot_homogen_power(obj)
```

Arguments

obj should be an "homogen_power" object

Value

Power curve plot for the user specified input parameters

plot_mod_power	<i>Plot Power Curve for Categorical Moderators</i>
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Description

Plots power curves for categorical moderator in meta-analysis

Usage

```
plot_mod_power(obj)
```

Arguments

obj This should be an 'mod_power' object

Value

Power curves for moderator analysis under fixed and random effects models

`plot_mpower`*Plot Power Curve for Meta-analysis*

Description

Plots power curves for fixed effects models with various effect size magnitudes. Also plots power curves for various levels of heterogeneity (e.g., $i^2 = 75$)

Usage

```
plot_mpower(obj)
```

Arguments

`obj` This should be an "mpower" object

Value

Power curve plot for the user specified input parameters

`plot_subgroup_power`*Plot Power Curve for Subgroup analysis*

Description

Plots power curves to detect subgroup differences in meta-analysis.

Usage

```
plot_subgroup_power(obj)
```

Arguments

`obj` This should be an 'subgroup_power' object

Value

Power curves to detect subgroup differences for fixed and random effects models

subgroup_power

*Compute Power for Subgroup Analysis in Meta-analysis***Description**

Computes statistical power for different subgroups under fixed and random effects models.

Usage

```
subgroup_power(
  n_groups,
  effect_sizes,
  study_size,
  k,
  i2 = 0.5,
  es_type,
  p = 0.05,
  con_table = NULL
)
```

Arguments

n_groups	Numerical value for the number of subgroups.
effect_sizes	Numerical values for effect sizes of for each group.
study_size	Numerical value for number of participants (per study).
k	Numerical value for total number of studies.
i2	Numerical value for Heterogeneity estimate (i^2).
es_type	Character reflecting effect size metric: 'r', 'd', or 'or'.
p	Numerical value for significance level (Type I error probability).
con_table	(Optional) List of numerical values for 2x2 contingency tables as a vector in the following format: c(a,b,c,d). These should be specified for each subgroup (i.e., n_groups).

2x2 Table	Group 1	Group 2
Present	a	b
Not Present	c	d

Value

Estimated Power estimates for subgroup differences under fixed- and random-effects models

See Also

https://jason-griffin.shinyapps.io/shiny_metapower/

Examples

```
subgroup_power(n_groups = 2,  
               effect_sizes = c(.1,.5),  
               study_size = 20,  
               k = 10,  
               i2 = .5,  
               es_type = "d")  
subgroup_power(n_groups = 2,  
               con_table = list(g1 = c(6,5,4,5), g2 = c(8,5,2,5)),  
               study_size = 40,  
               k = 20,  
               i2 = .5,  
               es_type = "or")
```

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