

Package: artcatr (via r-universe)

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Title Sample Size and Power for an Ordered Categorical Outcome

Version 0.1.0

Description Sample size and power calculations for a two-group randomized trial with an ordinal outcome analysed by a proportional-odds model. Implements the 'ologit' method of White, Marley-Zagar, Morris, Parmar, Royston & Babiker (2023) <doi:10.1177/1536867X231161934> in R.

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URL <https://github.com/dcr-unibe-ch/artcatr>,
<https://dcr-unibe-ch.github.io/artcatr/>

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Imports stats

Suggests knitr, rmarkdown, testthat (>= 3.0.0), Hmisc

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Repository <https://dcr-unibe-ch.r-universe.dev>

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artcatr

Sample size / power for a randomized trial with an ordered categorical outcome, analysed by the proportional-odds model

Description

Implements the methods of White et al (2023), including their new ologit method (which allows a non-proportional-odds anticipated effect via `pe`, is more accurate for large effects, and supports non-inferiority / substantial-superiority trials via `margin`), and Whitehead's (1993) original method for comparison.

Usage

```
artcatr(
  pc,
  cumulative = FALSE,
  pe = NULL,
  or = NULL,
  rr = NULL,
  margin = 1,
  favourable = NULL,
  power = NULL,
  n = NULL,
  aratio = c(1, 1),
  alpha = 0.05,
  onesided = FALSE,
  method = c("ologit", "whitehead"),
  variance = c("NA", "NN", "AA"),
  quiet = FALSE
)
```

Arguments

<code>pc</code>	Numeric vector. Anticipated probabilities (or cumulative probabilities, if <code>cumulative = TRUE</code>) in the control arm, one per outcome level, including the right-most level (probabilities must sum to 1, or cumulative probabilities must reach 1).
<code>cumulative</code>	Logical. Are <code>pc/pe</code> cumulative probabilities?
<code>pe</code>	Numeric vector. Anticipated (cumulative) probabilities in the experimental arm, specified like <code>pc</code> . Exactly one of <code>pe</code> , <code>or</code> , <code>rr</code> must be given (or none, if <code>margin != 1</code> , in which case <code>or = 1</code> is assumed).
<code>or</code>	Numeric scalar. Anticipated common odds ratio applied to the control-arm cumulative probabilities (assumes proportional odds). An odds ratio below 1 shifts probability towards the right-most level.
<code>rr</code>	Numeric scalar. Anticipated common risk ratio (applied to every level except the right-most).

margin	Numeric scalar odds ratio defining the null hypothesis. <code>margin = 1</code> (default) gives a superiority trial; otherwise a non-inferiority or substantial-superiority trial (see <code>favourable</code>).
favourable	Logical or NULL. Is the left-most outcome level the most favourable outcome? If NULL (default), inferred from the anticipated average odds ratio vs <code>margin</code> .
power	Numeric scalar in (0, 1). Power to achieve; sample size is calculated. Default 0.8 if neither power nor <code>n</code> given.
n	Numeric scalar. Total sample size; power is calculated.
aratio	Length-2 numeric vector, allocation ratio control:experimental (e.g. <code>c(1, 2)</code> means 2 experimental participants per 1 control).
alpha	Numeric scalar significance level. Default 0.05.
onesided	Logical. Is alpha one-sided? Default FALSE (two-sided).
method	One of "ologit" (default, the new method) or "whitehead".
variance	For <code>method = "ologit"</code> , one of "NA" (default, recommended by White et al 2023), "NN" (equivalent to Whitehead's method), or "AA". "NA" uses the null-hypothesis SE for the alpha term and the alternative-hypothesis SE for the beta (power) term; "NN"/"AA" use one SE for both.
quiet	Logical. Suppress the printed summary?

Value

A list with the computed sample size or power, per-group sample sizes, the anticipated probability table, and other design parameters (mirroring the Stata command's stored results).

References

White IR, Marley-Zagar E, Morris TP, Parmar MKB, Royston P, Babiker AG (2023). artcat: Sample-size calculation for an ordered categorical outcome. *Stata Journal* 23(1):3-23. <https://doi.org/10.1177/1536867X23111111>

Whitehead J (1993). Sample size calculations for ordered categorical data. *Statistics in Medicine* 12:2257-2271.

Examples

```
# FLU-IVIG trial (Davey et al 2019), reproducing White et al (2023) sec 4:
# default (new) ologit method
artcatr(pc = c(.018, .036, .156, .141, .39, .259), or = 1 / 1.77, power = .8,
        favourable = FALSE)

# Whitehead method, for comparison
artcatr(pc = c(.018, .036, .156, .141, .39, .259), or = 1 / 1.77, power = .8,
        favourable = FALSE, method = "whitehead")

# Non-inferiority trial (margin expressed as an odds ratio)
artcatr(pc = c(.010, .021, .099, .103, .384, .383), or = 1, margin = 1.33,
        power = .8, favourable = FALSE)
```

<code>print.artcatr</code>	<i>Print an artcatr object</i>
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Description

Print an artcatr object

Usage

```
## S3 method for class 'artcatr'
print(x, digits = 3, probtable = TRUE, ...)
```

Arguments

<code>x</code>	An object returned by <code>artcatr()</code> .
<code>digits</code>	Number of significant digits to round probabilities to.
<code>probtable</code>	Logical; include the table of anticipated probabilities?
<code>...</code>	Not used.

Value

`x`, invisibly.

<code>print.summary.artcatr</code>	<i>Print a summary.artcatr object</i>
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Description

Print a `summary.artcatr` object

Usage

```
## S3 method for class 'summary.artcatr'
print(x, ...)
```

Arguments

<code>x</code>	An object returned by <code>summary.artcatr()</code> .
<code>...</code>	Not used.

Value

`x`, invisibly.

summary.artcatr	<i>Tidy summary table of anticipated probabilities from an artcatr object</i>
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Description

Tidy summary table of anticipated probabilities from an artcatr object

Usage

```
## S3 method for class 'artcatr'  
summary(object, digits = 3, ...)
```

Arguments

object	An object returned by artcatr().
digits	Number of significant digits to round probabilities to.
...	Not used.

Value

A data frame with columns level, description (favourable/ unfavourable labels for the extreme levels), control, experimental, and (for non-inferiority/substantial-superiority designs) experimental_null.

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