Package 'r4lineups'

October 14, 2022

Title Statistical Inference on Lineup Fairness

Version 0.1.1

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Description Since the early 1970s eyewitness testimony researchers have recognised the
importance of estimating properties such as lineup bias (is the lineup biased against
the suspect, leading to a rate of choosing higher than one would expect by chance?),
and lineup size (how many reasonable choices are in fact available to the witness?
A lineup is supposed to consist of a suspect and a number of additional members,
or foils, whom a poor-quality witness might mistake for the perpetrator). Lineup
measures are descriptive, in the first instance, but since the earliest articles in
the literature researchers have recognised the importance of reasoning inferentially
about them. This package contains functions to compute various properties of
laboratory or police lineups, and is intended for use by researchers in forensic
psychology and/or eyewitness testimony research. Among others, the r4lineups package
includes functions for calculating lineup proportion, functional size, various
estimates of effective size, diagnosticity ratio, homogeneity of the diagnosticity
ratio, ROC curves for confidence x accuracy data and the degree of similarity of
faces in a lineup.

Depends R (>= 3.4.0)

Imports boot, dplyr, ggplot2, ggrepel, here, magick, magrittr, pROC,
psych, purrr, stats, utils

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Encoding UTF-8

LazyData true

RoxygenNote 6.0.1.9000

Suggests knitr, rmarkdown, pander

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

Date/Publication 2018-07-18 13:20:02 UTC

R **topics documented:**

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allfoilbias   *Bias for each lineup member*

Description

Function to compute bias for each lineup member (assuming foil is suspect, from Malpass, 1981)

Usage

```
allfoilbias(lineup_table, target_pos, k)
```

Arguments

lineup_table	A table of lineup choices
target_pos	A scalar, representing target position in lineup. Must be declared by user
k	Nominal size (i.e., total number of members in lineup). Must be specified by user (scalar).

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Examples

```
lineup_vec <- round(runif(100, 1, 6))
lineup_table <- table(lineup_vec)
x <- allfoilbias(lineup_table, 5, 6)
```

---

allfoil_cihigh   *Confidence Intervals for Proportion*

Description

Function to compute ci high for each foil in a lineup

Usage

```
allfoil_cihigh(linetabprops, sumlineup)
```

Arguments

linetabprops	A dataframe of bootstrapped lineup proportions
sumlineup	Number of members in a lineup

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

---

allprop   *Lineup proportion for all lineup members*

Description

Computes lineup proportion for each member in a lineup

Usage

```
allprop(lineup_vec, k)
```

Arguments

lineup_vec	A numeric vector of lineup choices
k	Number of members in lineup. Must be specified by user (scalar).

Value

Returns a vector containing lineup proportion for each lineup member

References

Wells, G. L., Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))

#Call:
x <- allprop(lineup_vec, k = 6)
```

---

chi_diag	*Chi-squared estimate of homogeneity of diagnosticity ratio*

Description

Function for getting chi-squared value for homogeneity of diagnosticity ratios

Usage

```
chi_diag(df)
```

Arguments

df
　　　　　　　A dataframe containing: ln(d), variance of ln(d), d weights

Details

- To compute linedf, use the diag_param helper function.
- To compute df, apply ln_diag_ratio, var_lnd & d_weights functions to linedf, then bind results into one dataframe (see **Examples**)
- The order in which the estimates are bound together (i.e., their position in the dataframe) is important, and should always be as follows: row 1: *var*, row 2: *lnd*, row 3: *wi*.

Value

Chi squared estimate of homogeneity of diagnosticity ratios for k independent lineups

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L., Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Target present data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)


#Target absent data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)

#Pos list
lineup1_pos <- c(1, 2, 3, 4, 5, 6)
lineup2_pos <- c(1, 2, 3, 4, 5)
lineup3_pos <- c(1, 2, 3, 4)
pos_list <- list(lineup1_pos, lineup2_pos, lineup3_pos)
rm(lineup1_pos, lineup2_pos, lineup3_pos)

#Nominal size:
k <- c(6, 5, 4)

#Use diag param helper function to get data (n11, n21, n12, n22):
linedf <- diag_param(lineup_pres_list, lineup_abs_list, pos_list, k)

#Get ln(d), variance of ln(d) & d weights:
ratio <- ln_diag_ratio(linedf)
var <- var_lnd(linedf)
wi <- d_weights(linedf)

#Bind estimates into one df of 3 rows & x observations
#(see Details above)
df <- t(cbind(ratio, var, wi))

#Call:
chi_diag(df)
```

---

compare_eff_sizes.boot

Comparing Effective Size: Base function for bootstrapping

Description

A base function for bootstrapping a dataframe of choices for 2 independent lineups

Usage

```
compare_eff_sizes.boot(linedf, d)
```

Arguments

`linedf`	A dataframe of lineup data. Must consist of 2 columns, each containing data for 2 independent lineups
`d`	Indices for bootstrap sample. Argument used by boot function to select samples for bootstrapping

Details

The approach here is to compute the effective size of each lineup separately, and to take the difference between them. This is then bootstrapped, and if the bootstrap does not contain 0, we conclude the effective size estimates are different at p = alpha

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

`datacheck1`	*Helper function*

Description

Checks that number of lineup choices contained in a vector is accurate

Usage

```
datacheck1(lineup_vec, k)
```

Arguments

lineup_vec   A numeric vector of lineup choices

k   Number of members in lineup

Details

This function ensures that a non-selected lineup member is not accidentally omitted from the dataframe due to lack of selection by all mock witnesses. It functions as a check that the total number of lineup members is accurate.

---

datacheck2   *Helper function*

Description

Checks that number of lineup choices contained in a vector is accurate

Usage

```
datacheck2(lineup_pres, lineup_abs, k1, k2)
```

Arguments

lineup_pres   A numeric vector of lineup choices for a lineup in which the target was present

lineup_abs   A numeric vector of lineup choices for a lineup in which the target was absent

k1   Number of targets in TP lineup

k2   Number of targets in TA lineup

Details

This function ensures that a non-selected lineup member is not accidentally omitted from the dataframe due to lack of selection by all mock witnesses. It functions as a check that the total number of lineup members is accurate

---

datacheck3 *Helper function*

Description

Checks that number of lineup choices contained in a data table is accurate

Usage

```
datacheck3(lineup_table, k)
```

Arguments

lineup_table	A table of lineup choices
k	Nominal size (i.e., total number of members in lineup)

Details

This function ensures that a non-selected lineup member is not accidentally omitted from the data due to lack of selection by all mock witnesses. It functions as a check that the total number of lineup members is accurate.

---

diag_param *Parameters for diagnosticity ratio*

Description

This function calculates the parameters needed to calculate the diagnosticity ratio for several lineup pairs.

Usage

```
diag_param(lineup_pres_list, lineup_abs_list, pos_list, k)
```

Arguments

lineup_pres_list

A list containing k vectors of lineup choices for k lineups, in which the target was present

lineup_abs_list

A list containing k vectors of lineup choices for k lineups, in which the target was absent

pos_list	A list containing k numeric vectors indexing lineup member positions for each lineup pair
k	A vector indexing number of members in each lineup pair. Must be specified by user (scalar).

Details

- Lineup pairs consist of one lineup in which the target was present (TP) and one lineup in which the target was absent (TA).

- Each lineup pair must occupy corresponding positions in the TA and TP lists.

  Example:

  For a lineup pair A that consists of (1)TP lineup and (2)TA lineup: A(1) is the first vector in the TP list A(2) is the first vector in the TP list

- The order in which nominal size for each lineup pair is listed must also correspond with the positions of each respective lineup in the lineup lists (i.e., if lineup 1 has k = 6, then the first element of vector 'k' = 6)

- Data must be in a list format. This allows the function to compare lineups in which the number of choices and number of lineup members differs.

- The following warning will appear if vectors comprising lineup lists are of different lengths: *longer object length is not a multiple of shorter object length*. **This does not affect the accuracy of the function and can be ignored.**

Value

Returns a dataframe containing:

- *n11*: Number of mock witnesses who identified the suspect in the target present condition

- *n21*: Number of mock witnesses who did not identify the suspect in the target present condition

- *n12*: Number of mock witnesses who identified the suspect in the target absent condition

- *n13*: Number of mock witnesses who did not identify the suspect in the target absent condition

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Target present data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
```

```
C <- round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)


#Target absent data:
A <- round(runif(100,1,6))
B <- round(runif(70,1,5))
C <- round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)

#Pos list
lineup1_pos <- c(1, 2, 3, 4, 5, 6)
lineup2_pos <- c(1, 2, 3, 4, 5)
lineup3_pos <- c(1, 2, 3, 4)
pos_list <- list(lineup1_pos, lineup2_pos, lineup3_pos)
rm(lineup1_pos, lineup2_pos, lineup3_pos)

#Nominal size:
k <- c(6, 5, 4)

#Call:
linedf <- diag_param(lineup_pres_list, lineup_abs_list, pos_list, k)
```

---

diag_ratio_T   *Diagnosticty Ratio (Tredoux, 1998)*

Description

Computes Wells's adjusted diagnosticity ratio for one lineup pair (see: Tredoux, 1998)

Usage

```
diag_ratio_T(lineup_pres, lineup_abs, pos_pres, pos_abs, k1, k2)
```

Arguments

lineup_pres	A numeric vector of lineup choices for a lineup in which the target was present
lineup_abs	A numeric vector of lineup choices for a lineup in which the target was absent
pos_pres	A scalar, representing target position in TP lineup. Must be declared by user
pos_abs	A scalar, representing target position in TA lineup. Must be declared by user
k1	Number of targets in TP lineup. Must be specified by user (scalar).
k2	Number of targets in TA lineup. Must be specified by user (scalar).

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_pres <- round(runif(100, 1, 6))
lineup_abs <- round(runif(70, 1, 5))
pos_pres <- 3
pos_abs <- 5

#Call:
diag_ratio_T(lineup_pres, lineup_abs, pos_pres, pos_abs, 6, 5)
diag_ratio_T(lineup_pres, lineup_abs, 3, 5, 6, 5)
```

---

diag_ratio_W   *Diagnosticity Ratio (Wells & Lindsay, 1980; Wells & Turtle, 1986)*

Description

Computes Wells' diagnosticity ratio for one lineup pair

Usage

```
diag_ratio_W(lineup_pres, lineup_abs, pos_pres, pos_abs, k1, k2)
```

Arguments

lineup_pres	A numeric vector of lineup choices for a lineup in which the target was present
lineup_abs	A numeric vector of lineup choices for a lineup in which the target was absent
pos_pres	A scalar, representing target position in TP lineup. Must be declared by user
pos_abs	A scalar, representing target position in TA lineup. Must be declared by user
k1	Number of targets in TP lineup. Must be specified by user (scalar).
k2	Number of targets in TA lineup. Must be specified by user (scalar).

References

Wells, G. L., & Lindsay, R. C. L. (1980).On estimating the diagnosticity of eyewitness nonidentifi-cations.*Psychological Bulletin, 88*, 776-784.

Wells, G. L., & Turtle, J. W. (1986). Eyewitness identification: The importance of lineup models. *Psychological Bulletin, 99*, 320-329.

Examples

```
#Data:
lineup_pres <- round(runif(100, 1, 6))
lineup_abs <- round(runif(70, 1, 5))
pos_pres <- 3
pos_abs <- 5

#Call:
diag_ratio_W(lineup_pres, lineup_abs, pos_pres, pos_abs, 6, 5)
diag_ratio_W(lineup_pres, lineup_abs, 3, 5, 6, 5)
```

---

d_bar   *Mean diagnosticity ratio for k lineup pairs*

Description

Function for computing pooled estimator from a set of k diagnosticity ratios

Usage

```
d_bar(df)
```

Arguments

df   A dataframe containing rows: ln(d), variance of ln(d), d weights

Details

. The order in which the estimates are bound together (i.e., their position in the dataframe) is important, and should always be as follows:

- row 1: var
- row 2: lnd
- row 3: wi

Value

Mean diagnosticity ratio for k independent lineups

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Target present data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)


#Target absent data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)

#Pos list
lineup1_pos <- c(1, 2, 3, 4, 5, 6)
lineup2_pos <- c(1, 2, 3, 4, 5)
lineup3_pos <- c(1, 2, 3, 4)
pos_list <- list(lineup1_pos, lineup2_pos, lineup3_pos)
rm(lineup1_pos, lineup2_pos, lineup3_pos)

#Nominal size:
k <- c(6, 5, 4)

#Use diag param helper function to get data (n11, n21, n12, n22):
linedf <- diag_param(lineup_pres_list, lineup_abs_list, pos_list, k)

#Compute ln(d):
ratio <- ln_diag_ratio(linedf)

#Compute variance of ln(d):
var <- var_lnd(linedf)

#Compute weights for pooled estimator:
```

```
wi <- d_weights(linedf)

#Bind ln(d), variance of ln(d) and weights into one df (of 3 rows & x observations)
#(see Details above):
df <- t(cbind(ratio, var, wi))

#Call:
d_bar(df)
```

---

d_weights   *Diagnosticity ratio weights*

Description

Function to compute weights of each diagnosticity ratio for k lineup pairs

Usage

```
d_weights(linedf)
```

Arguments

linedf   A dataframe of parameters for computing diagnosticity ratio

Details

In order to obtain a pooled estimate of a set of diagnosticity ratios, we use a weight for each ratio that is equal to the inverse of its variance.

To get linedf, use the diag_param helper function

diag_param returns a dataframe containing the following:

- *n11*: Number of mock witnesses who identified the suspect in the target present condition
- *n21*: Number of mock witnesses who did not identify the suspect in the target present condition
- *n12*: Number of mock witnesses who identified the suspect in the target absent condition
- *n13*: Number of mock witnesses who did not identify the suspect in the target absent condition

Value

A dataframe with one column containing weights for each pair of lineups for which diagnosticity ratio is being calculated.

References

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Examples

```
#Target present data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)


#Target absent data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)

#Pos list
lineup1_pos <- c(1, 2, 3, 4, 5, 6)
lineup2_pos <- c(1, 2, 3, 4, 5)
lineup3_pos <- c(1, 2, 3, 4)
pos_list <- list(lineup1_pos, lineup2_pos, lineup3_pos)
rm(lineup1_pos, lineup2_pos, lineup3_pos)

#Nominal size:
k <- c(6, 5, 4)

#Use diag param helper function to get data (n11, n21, n12, n22):
linedf <- diag_param(lineup_pres_list, lineup_abs_list, pos_list, k)

#Call:
wi <- d_weights(linedf)
```

---

effsize_compare	*Master Function: Comparing Effective Size*

Description

Function for comparing effective size of two independent lineups (Tredoux, 1998)

Usage

```
effsize_compare(linedf)
```

Arguments

linedf   A dataframe of lineup data. Contains 2 columns, each of which hold data for 2
                independent lineups

Details

This function is a master function, calling other functions it needs, and reporting results in some detail

Value

Effective size, significance level, and confidence intervals (95 normal theory, percentile & bias-corrected)

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

See Also

[boot](): https://cran.r-project.org/web/packages/boot/boot.pdf

Examples

```
#Data:

lineup_vec1 <- round(runif(100, 1, 6))
lineup_vec2 <- round(runif(100, 1, 6))
linedf <- as.data.frame(cbind(lineup_vec1, lineup_vec2))

#Call:
x <- effsize_compare(linedf)
```

eff_size_per_foils   *Effective Size per Foils*

Description

Function for computing effective size (Malpass, 1981) counting foils who fall within the CI for chance guessing

Usage

```
eff_size_per_foils(lineup_vec, target_pos, k, conf = 0.95)
```

Arguments

lineup_vec	A numeric vector of lineup choices
target_pos	A numeric vector indexing all lineup members
k	Number of members in lineup. Must be specified by user (scalar).
conf	Desired level of alpha. Defaults to 0.95. May be specified by user (scalar).

References

Malpass, R S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*, 299-309.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
target_pos <- c(1, 2, 3, 4, 5, 6)

#Call:
eff_size_per_foils(lineup_vec, target_pos, 6)
eff_size_per_foils(lineup_vec, target_pos, conf = 0.95, 6)
```

esize_m   *Effective Size*

Description

Function for computing Effective Size

Usage

```
esize_m(lineup_table, k, both = FALSE)
```

Arguments

`lineup_table`	A table of lineup choices
`k`	Number of members in lineup. Must be specified by user (scalar).
`both`	Defaults to FALSE. Returns Tredoux's adjusted effective size estimate.
	If TRUE, provides both Malpass's (1981) and Makpass's adjusted (see: Tredoux, 1998) calculations of effective size.

Details

Reduces the size of a lineup from a (corrected) nominal starting value by the degree to which members are, in sum, chosen below the level of chance expectation.

Value

Malpass's original & adjusted estimates of effective size

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))

#Call:
esize_m(lineup_vec, 6, both = TRUE)
esize_m(lineup_vec, 6)
```

---

esize_m_boot *Bootstrapped Effective Size*

Description

Base function for computing bootstrapped effective size

Usage

```
esize_m_boot(lineup_vec, d, k)
```

Arguments

lineup_vec	A vector of lineup choices
d	Indices for bootstrap resampling
k	A vector indexing number of members in each lineup pair. Must be specified by user (scalar).

Details

Function to call when bootstrap resampling using boot function (in package 'boot')

Value

If printarg=FALSE, provides only Malpass's priginal calculation of effective size

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

See Also

boot: https://cran.r-project.org/web/packages/boot/boot.pdf

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))

#Get boot object:
bootobject <- boot::boot(lineup_vec, esize_m_boot, k = 6, R=1000)
bootobject

#To get confidence intervals:
cis <- boot::boot.ci(bootobject, conf = 0.95, type = "all")
```

---

esize_T   *Effective Size (Tredoux, 1998)*

Description

Function for generating Effective Size (Tredoux, 1998)

Usage

```
esize_T(lineup_table)
```

Arguments

lineup_table   A table of lineup choices

Details

Reduces the size of a lineup from a (corrected) nominal starting value by the degree to which members are, in sum, chosen below the level of chance expectation.

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), Handbook of Eyewitness Psychology, Vol. 2: Memory for people (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22(2)*, 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L., Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
lineup_table <- table(lineup_vec)

#Call:
e <- esize_T(lineup_table)
```

---

esize_T_boot *Bootstrapped Effective Size (Tredoux, 1998)*

Description

Base function for generating boostrapped Effective Size (Tredoux, 1998)

Usage

```
esize_T_boot(lineup_table, d)
```

Arguments

lineup_table	A table of lineup choices
d	Indices for bootstrap resampling

Details

Reduces the size of a lineup from a (corrected) nominal starting value by the degree to which members are, in sum, chosen below the level of chance expectation.

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), Handbook of Eyewitness Psychology, Vol. 2: Memory for people (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22(2)*, 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L., Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

See Also

[boot](): https://cran.r-project.org/web/packages/boot/boot.pdf

---

esize_T_ci_n	*Effective Size with Confidence Intervals from Normal Theory (Tredoux, 1998)*

Description

Function for generating Effective Size (Tredoux, 1998) with CIs from normal theory

Usage

```
esize_T_ci_n(lineup_table, alpha)
```

Arguments

lineup_table	A table of lineup choices
alpha	Alpha level to be declared by user (scalar)

Details

Reduces the size of a lineup from a (corrected) nominal starting value by the degree to which members are, in sum, chosen below the level of chance expectation

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
lineup_table <- table(lineup_vec)

#Call:
e_ci <- esize_T_ci_n(lineup_table, .95)
```

---

face_sim   *Compute similarity of faces in a lineup; experimental function*

Description

Function to compute the degree to which each face in a set of faces loads onto a common factor computed from the faces.

Usage

```
face_sim()
```

Details

- The faces need to be standardized for inter-pupil distance, and for pupil location prior to running the function

- The user will be asked to choose a set of faces through a dialog box. These should be jpeg files.

- There is no argument to the function; it gets what it needs from the dialog box. The function prints the lineup array to the viewer pane in R, and reports the loading of each face on the first common factor in a factor analysis (using fa in package psych)

References

Tredoux, C. (2002). A direct measure of facial similarity and its relation to human similarity perceptions. *Journal of Experimental Psychology: Applied, 8*(3), 180-193. doi:10.1037/1076-898x.8.3.180

---

func_size   *Functional Size*

Description

This function computes functional size (N/D), where N = number of mock witnesses, & D = number of mock witnesses choosing the target

Usage

```
func_size(lineup_vec, target_pos)
```

Arguments

lineup_vec	A numeric vector of lineup choices
target_pos	A scalar, representing target position in lineup. Must be declared by user

Details

An estimation of the number of plausible lineup members in a given lineup.

Value

Functional size of lineup

References

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
target_pos <- 3

#Call:
x <- func_size(lineup_vec, target_pos)
x <- func_size(lineup_vec, 3)
```

---

func_size.boot *Bootstrapped Functional Size*

Description

This function is a base function for the bootstrapping that ensues to compute bootstrapped confidence intervals for the estimate of functional size

Usage

```
func_size.boot(lineup_vec, d = d, target_pos)
```

Arguments

lineup_vec	A numeric vector of lineup choices
d	Indices for bootstrap resampling
target_pos	A scalar, representing position of target in lineup. Must be declared by user

Details

Function is called bootstrap resampling using boot function (in package 'boot') This function is never called by the user - it is called in the functional size master function

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

See Also

boot: https://cran.r-project.org/web/packages/boot/boot.pdf

---

func_size_report	*Functional Size with Bootstrapped Confidence Intervals*

Description

This function is a master function, calling other functions it needs, and reporting results in some detail

Usage

```
func_size_report(lineup_vec, target_pos, k, R)
```

Arguments

lineup_vec	A numeric vector of lineup choices
target_pos	A scalar, representing target position in lineup. Must be declared by user
k	Number of members in lineup. Must be specified by user (scalar).
R	Number of bootstrap samples. Defaults to 1000

Details

Function depends on functions from package 'boot'

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

See Also

boot: https://cran.r-project.org/web/packages/boot/boot.pdf

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
target_pos <- 3

#Call:
x <- func_size_report(lineup_vec, target_pos, 6)
x <- func_size_report(lineup_vec, 3, 6)
```

---

gen_boot_propci	*Percentile of Bootstrapped Lineup Proportion*

Description

Function for computing arbitrary percentile of bootstrapped lineup proportion

Usage

```
gen_boot_propci(lineuprops, perc = 0.05)
```

Arguments

lineuprops	A vector of bootstrapped lineup proportions
perc	Percentile to be computed. Must be declared by user (scalar)
	Defaults to .05

Details

Can be used to calculate confidence intervals at desired level of alpha

Value

Arbitrary percentile of bootstrapped lineup proportion

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
target_pos <- 3
k <- 6

#Bootstrap data:
lineup_boot_df <- gen_boot_samples(lineup_vec, 1000)

#Compute proportion for bootstrap samples:
lineuprops <- gen_lineup_prop(lineup_boot_df, target_pos, 6)

#Get boot CIs:
prop_bootci_lower <- gen_boot_propci(lineuprops, perc = .025)
prop_bootci_upper <- gen_boot_propci(lineuprops, perc = .975)
```

---

gen_boot_propmean_se   *Descriptive statistics for bootstrapped lineup proportion*

Description

Function for computing mean. med and se of boot proportion

Usage

```
gen_boot_propmean_se(lineuprops)
```

Arguments

lineuprops   A dataframe of bootstrapped lineup proportions

Value

Mean, median, standard deviation, standard error & 95 CIs of lineup proportion across a bootstrapped dataframe

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
target_pos <- 3

#Bootstrap data:
lineup_boot_df <- gen_boot_samples(lineup_vec, 1000)
```

```
#Compute proportion for bootstrap samples:
lineuprops <- gen_lineup_prop(lineup_boot_df, target_pos = 3, k = 6)

#Call:
gen_boot_propmean_se(lineuprops)

#OR:

lineuprops <- boot::boot(lineup_vec, lineup_prop_boot, target_pos = 3, R = 1000)
gen_boot_propmean_se(lineuprops$t)
```

gen_boot_samples *Bootstrap resampling*

Description

Function for generating bootstrapped samples from 1 vector of lineup data

Usage

```
gen_boot_samples(lineup_vec, bootno)
```

Arguments

lineup_vec	A numeric vectors of lineup choices
bootno	Number of bootstrap samples

Value

A dataframe of bootstrapped lineup data

Examples

```
#Data:
lineup_vec <- round(runif(100,1,6))
bootno <- 1000

#Call:
bootdf <- gen_boot_samples(lineup_vec, bootno)
```

---

gen_boot_samples_list *Bootstrapped resampling*

Description

Function for generating bootstrapped samples for of k vectors of lineup choices

Usage

```
gen_boot_samples_list(lineup_list, bootno)
```

Arguments

lineup_list   A list containing k vectors of lineup choices for k lineups, in which the target
               was either absent or present

bootno   Number of bootstrap samples

Value

A list of bootstrapped lineup data Length of list = no. of boostrap sample draws

Examples

```
#Data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
linelist <- list(A, B, C)
rm(A, B, C)

bootno <- 1000

#Call:
bootdata <- gen_boot_samples_list(linelist, bootno)
```

---

gen_esize_m   *Effective Size (across a dataframe)*

Description

Function for computing Effective Size (Tredoux, 1998) on lineups contained as columns in a df,
usually from a bootstrapped sample

Usage

```
gen_esize_m(lineup_boot_df, k)
```

Arguments

lineup_boot_df   A dataframe containing bootstrapped samples of lineup data

k   Number of members in lineup. Must be specified by user (scalar).

Details

This function computes effective size for k lineups simultaneously.

Value

A vector of effective size calculations for each lineup in bootstrapped df

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100,1,6))
bootdf <- gen_boot_samples(lineup_vec, 1000)

#Call:
esize_vec <- gen_esize_m(bootdf, 6)
```

---

gen_esize_m_ci   *Bootstrapped Confidence Intervals for Effective Size*

Description

Function for computing Effective Size (Malpass, 1981, as adjusted by Tredoux, 1998) with CIs from bootstrap df of lineups

Usage

```
gen_esize_m_ci(lineupsizes, perc = 0.05)
```

Arguments

`lineupsizes`	A vector of bootstrapped effective sizes
`perc`	Defaults to .05. Can be specified by user, according to desired level of alpha (scalar)

Value

Confidence intervals for effective size

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
k <- 6

#Use gen_boot_samples to get bootstrapped data:
bootdata <- gen_boot_samples(lineup_vec, 1000)

#Compute effective size over df of bootstrapped data:
lineupsizes <- gen_esize_m(bootdata, 6)

#Call:
gen_esize_m_ci(lineupsizes)
gen_esize_m_ci(lineupsizes, perc = .025)
gen_esize_m_ci(lineupsizes, perc = .975)
```

---

gen_lineup_prop   *Lineup proportion over dataframe*

Description

Function for computing lineup proportion over a dataframe

Usage

```
gen_lineup_prop(lineup_boot_df, target_pos, k)
```

Arguments

`lineup_boot_df`	Dataframe of lineup choices (usually a bootstrapped set)
`target_pos`	A scalar, representing target position in lineup. Must be declared by user.
`k`	A vector indexing number of members in each lineup pair (nominal size). Must be specified by user (scalar).

Value

A vector of bootstrapped proportions, indicating the frequency with which a target was identified in a lineup Length of vector = number of bootstrap sample draws

Examples

```
#Data
lineup_vec <- round(runif(100, 1, 6))
target_pos <- 3

#Get bootstrapped data:
lineup_boot_df <- gen_boot_samples(lineup_vec, 1000)

#Call:
lineuprops <- gen_lineup_prop(lineup_boot_df, 3, 6)
```

---

gen_linevec   *Lineup vector*

Description

A function that takes a table of lineup choices and generates a vector of raw lineup data

Usage

```
gen_linevec(lineup_table, k)
```

Arguments

lineup_table   A table of lineup choices

k   Nominal size (i.e.,total number of lineup members). Must be declared by user

Value

Returns a vector of lineup choices

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
lineup_table <- table(lineup_vec)

#Call:
lineup_vec <- gen_linevec(lineup_table, 3)
```

---

homog_diag   *Master function: Homogeneity of diagnosticity ratio*

Description

This function provides assesses the homogeneity of the diagnosticity ratio of k lineup pairs.

Usage

```
homog_diag(lineup_pres_list, lineup_abs_list, pos_list, k)
```

Arguments

lineup_pres_list

      A list containing k vectors of lineup choices for k lineups, in which the target was present

lineup_abs_list

      A list containing k vectors of lineup choices for k lineups, in which the target was absent

pos_list   A numeric vector indexing lineup member positions for the target present & absent conditions.

k   A vector indexing number of members in each lineup pair (nominal size). Must be specified by user (scalar).

Details

Master function for assessing homogeneity of diagnosticity ratio for k independent lineups.

Value

Computes diagnosticity ratio with chi-squared estimate and significance level for k lineup pairs

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Target present data:
A <- round(runif(100,1,6))
B <- round(runif(70,1,5))
C <- round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)

#Target absent data:
A <- round(runif(100,1,6))
B <- round(runif(70,1,5))
C <- round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)

#Pos list
lineup1_pos <- c(1, 2, 3, 4, 5, 6)
lineup2_pos <- c(1, 2, 3, 4, 5)
lineup3_pos <- c(1, 2, 3, 4)
pos_list <- list(lineup1_pos, lineup2_pos, lineup3_pos)
rm(lineup1_pos, lineup2_pos, lineup3_pos)

#Nominal size:
k <- c(6, 5, 4)

#Call:
homog_diag(lineup_pres_list, lineup_abs_list, pos_list, k)
```

---

homog_diag_boot   *Homogeneity of diagnosticity ratio with bootstrapped CIs*

Description

Function for computing bootstrapped estimates of homogeneity of diagnosticity ratio

Usage

```
homog_diag_boot(lineup_pres_list, lineup_abs_list, k, R = 100)
```

Arguments

lineup_pres_list

A list containing k vectors of lineup choices for k lineups, in which the target was present

lineup_abs_list

A list containing k vectors of lineup choices for k lineups, in which the target was absent

k   Number of members in lineup. Must be specified by user (scalar).

R   Number of bootstrap replications. Defaults to R = 100.

Details

Computes bootstrapped diagnosticity ratio with chi-squared estimate, significance level and confidence intervals for k lineup pairs

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Target present data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)

#Target absent data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)
```

---

i_esize_T   *I Component of Effective Size(Tredoux, 1998)*

Description

Function for generating I component of effective size

Usage

```
i_esize_T(lineup_table)
```

Arguments

lineup_table   A table of lineup choices

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))
lineup_table <- table(lineup_vec)

#Call:
i <- i_esize_T(lineup_table)
```

---

line73   *line73*

Description

A dataframe of lineup choices for 1 trial; real data from a Doob & Kirshenbaum (1973) article. This article was the first to discuss lineup size 1 column x 42 observations

42 mock witnesses Nominal size is 6 Target position is 4

Usage

```
data(line73)
```

Format

An object of class data.frame with 42 rows and 1 columns.

References

Doob, A. N., & Kirshenbaum, H. M. (1973). Bias in police lineups-Partial remembering. *Journal of Police Science and Administration, 1*, 287-293.

lineup_boot_allprop   *Confidence intervals for lineup proportion*

Description

Computes bootstrapped confidence intervals for lineup proportion

Usage

```
lineup_boot_allprop(lineup_vec, k, conf = 0.95)
```

Arguments

lineup_vec	A numeric vector of lineup choices
k	Number of targets in lineup. Must be specified by user (scalar).
conf	Desired level of alpha. Defaults to 0.95. May be specified by user (scalar).

Details

Function that computes bootstrapped lineup proportion using 1000 bootstrap draws Calls 'boot function in 'boot' package

Value

Returns a vector of bias corrected confidence intervals for lineup proportion for each member in a lineup

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Wells, G. L., Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

See Also

boot: https://cran.r-project.org/web/packages/boot/boot.pdf

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))

#Call:
lineuprops_ci <- lineup_boot_allprop(lineup_vec, k= 6)
lineuprops_ci <- lineup_boot_allprop(lineup_vec, k= 6, conf = 0.975)
```

---

lineup_prop_boot   *Bootstrapped lineup proportion*

Description

Base function for computing bootstrapped lineup proportion for a lineup member

Usage

```
lineup_prop_boot(lineup_vec, d, target_pos)
```

Arguments

lineup_vec	A numeric vector of lineup choices
d	Indices for bootstrap sample. Argument used by boot function to select samples for bootstrapping
target_pos	A scalar, representing target position in lineup. Must be declared by user

Details

Function to call when bootstrap resampling using boot function

References

Davison, A.C. & Hinkley, D.V. (1997). *Bootstrap methods and their application*. Cambridge University Press.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

See Also

boot: https://cran.r-project.org/web/packages/boot/boot.pdf

Examples

```
lineup_vec <- round(runif(100, 1, 6))

bootobject <- boot::boot(lineup_vec, lineup_prop_boot, target_pos = 3, R = 1000)
cis <- boot::boot.ci(bootobject, conf = 0.95, type = "all")
```

---

lineup_prop_tab *Lineup proportion*

Description

Computes the proportion of mock witnesses identifying a particular lineup member

Usage

```
lineup_prop_tab(lineup_table, target_pos)
```

Arguments

lineup_table   A table of lineup choices

target_pos   A scalar, representing target position in lineup. Must be declared by user

Value

Returns a proportion indicating the frequency with which a lineup member was selected

References

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1))
lineup_table <- table(lineup_vec)

#Call:
lineup_prop_tab(lineup_table, 3)
lineup_prop_tab(table(lineup_vec), 2)
```

---

lineup_prop_vec *Lineup proportion*

Description

Computes the proportion of mock witnesses identifying a particular lineup member

Usage

```
lineup_prop_vec(lineup_vec, target_pos, k)
```

Arguments

`lineup_vec`	A numeric vector of lineup choices
`target_pos`	Suspect/lineup member position. Must be declared by user (scalar).
`k`	Nominal size (i.e., total number of members in lineup). Must be specified by user (scalar).

Value

Returns a proportion indicating the frequency with which a target was identified in a lineup

References

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_vec <- round(runif(100, 1, 6))

#Call:
lineup_prop_vec(lineup_vec, 3, 6)
```

`ln_diag_ratio`	*Ln of Diagnosticity Ratio*

Description

Computes ln of diagnosticity ratio: ln(d)

Usage

```
ln_diag_ratio(linedf)
```

Arguments

`linedf`	A dataframe of parameters for computing diagnosticity ratio

Details

To get linedf, use the diag_param helper function

diag_param returns a dataframe containing the following:

- *n11*: Number of mock witnesses who identified the suspect in the target present condition
- *n21*: Number of mock witnesses who did not identify the suspect in the target present condition
- *n12*: Number of mock witnesses who identified the suspect in the target absent condition
- *n13*: Number of mock witnesses who did not identify the suspect in the target absent condition

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology, 13*, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Target present data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)


#Target absent data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)

#Pos list
lineup1_pos <- c(1, 2, 3, 4, 5, 6)
lineup2_pos <- c(1, 2, 3, 4, 5)
lineup3_pos <- c(1, 2, 3, 4)
pos_list <- list(lineup1_pos, lineup2_pos, lineup3_pos)
rm(lineup1_pos, lineup2_pos, lineup3_pos)

#Nominal size:
k <- c(6, 5, 4)

#Use diag param helper function to get data (n11, n21, n12, n22):
linedf <- diag_param(lineup_pres_list, lineup_abs_list, pos_list, k)

#Call:
lnd <- ln_diag_ratio(linedf)
```

---

makevec_prop   *Helper functions*

Description

Several helper functions that compute bootcis from proportions

Usage

```
makevec_prop(prop, n)
```

Arguments

prop	A dataframe of bootstrapped proportions
n	Number of lineup members

---

make_roc   *Compute and plot ROC curve for lineup accuracy ~ confidence*

Description

Function to compute and plot an ROC curve for data from an eyewitness experiment, where accuracy is recorded for target present and target absent lineups

Usage

```
make_roc(df_confacc)
```

Arguments

df_confacc	A dataframe with two columns, named confidence and accuracy (where accuracy = binary accuracy)

Details

The approach is outlined in several papers by Mickes, Wixted, Gronlund, Clark, and others (see **References**)

This function is a user level function. It chains the two roc functions together. The user must pass a dataframe, with one column indicating confidence, and another accuracy, and these must be named as such.

The approach is outlined in several papers by Mickes, Wixted, Gronlund, Clark, and others (see references)

Value

An ROC object of package pROC

References

Gronlund, S. D., Wixted, J. T., & Mickes, L. (2014). Evaluating eyewitness identification procedures using receiver operating characteristic analysis. *Current Directions in Psychological Science, 23*(1), 3-10.

Examples

```
#Data:
data(mickwick)

#Call:
make_roc(mickwick)
```

---

make_rocdata	*Helper functions: Compute and plot ROC curve for lineup accuracy ~ confidence*

Description

Function to compute and plot an ROC curve for data from an eyewitness experiment, where accuracy is recorded for target present and target absent lineups

Usage

```
make_rocdata(df_confacc)
```

Arguments

df_confacc   A df with two columns, confidence and accuracy, where accuracy = binary accuracy.

Value

An ROC object of package pROC

---

mickwick	*Confidence & Accuracy data (Mickes & Wixted)*

Description

Data capturing confidence and accuracy for a lineup trial

Usage

```
data(mickwick)
```

Format

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 100 rows and 2 columns.

Details

mickwick

---

mockdata	*mockdata*

Description

A dataframe containing real lineup data.

3 columns x 94 observations.

The first column simply provides the participant number, whilst the second and third contain data for each participant's choice (i.e., the position of the lineup member that they identified) and a confidence score for each choice.

In the field of eyewitness testimony, it is common for participants to rate how confident they are that they have accurately identified the perpetrator. Here, confidence is recorded as a percentage.

This lineup has the following parameters:

- 94 mock witness choices
- Target position is 7
- Nominal size is 9

Usage

```
data(mockdata)
```

Format

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 94 rows and 3 columns.

---

nortje2012   *nortje2012*

Description

A data file containing lineup data for 3 independent lineups. 133 rows x 3 columns. Each lineup
trial consisted of 133 mock witnesses & 8 lineup members.

- : Target position for lineup 1 is 3
- : Target position for lineup 2 is 6
- : Target position for lineup 3 is 2

Usage

```
data(nortje2012)
```

Format

An object of class tbl_df (inherits from tbl, data.frame) with 133 rows and 3 columns.

---

rep_index   *Rep index*

Description

Helper function that repeats a number k times

Usage

```
rep_index(index, num)
```

Arguments

index	Number to be repeated
num	Number of times to repeat index

Details

Can be used to create vectors of lineup data

Examples

```
rep_index(1, 10)
```

---

rot_vector *Rotate vector*

Description

Helper function to rotate vector

Usage

```
rot_vector(lineup_vec)
```

Arguments

lineup_vec   A vector of lineup data

---

show_lineup *Helper function*

Description

Helper function

Usage

```
show_lineup(file_list)
```

Arguments

file_list   A selection of image files (raw data)

---

var_diag_ratio *Variance of diagnosticity ratio (Tredoux)*

Description

Computes the variance of the diagnosticity ratio for a lineup pair

Usage

```
var_diag_ratio(lineup_pres, lineup_abs, pos_pres, pos_abs, k1, k2)
```

Arguments

`lineup_pres`	A numeric vector of lineup choices for a lineup in which the target was present
`lineup_abs`	A numeric vector of lineup choices for a lineup in which the target was absent
`pos_pres`	A scalar, representing target position in TP lineup. Must be declared by user
`pos_abs`	A scalar, representing target position in TA lineup. Must be declared by user
`k1`	Number of targets in TP lineup. Must be specified by user (scalar).
`k2`	Number of targets in TA lineup. Must be specified by user (scalar).

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Data:
lineup_pres <- round(runif(100, 1, 6))
lineup_abs <- round(runif(100, 1, 6))
pos_pres <- 3
pos_abs <- 4

#Call:
var_d <- var_diag_ratio(lineup_pres, lineup_abs, pos_pres, pos_abs, 6, 6)
var_d <- var_diag_ratio(lineup_pres, lineup_abs, 3, 4, 6, 6)
```

---

var_lnd	*Variance of ln of diagnosticity ratio*

Description

Function to compute variance of ln(d) for k lineup pairs

Usage

```
var_lnd(linedf)
```

Arguments

linedf   A dataframe of parameters for computing diagnosticity ratio

Details

To get linedf, use the diag_param helper function

diag_param returns a dataframe containing the following:

- *n11*: Number of mock witnesses who identified the suspect in the target present condition
- *n21*: Number of mock witnesses who did not identify the suspect in the target present condition
- *n12*: Number of mock witnesses who identified the suspect in the target absent condition
- *n13*: Number of mock witnesses who did not identify the suspect in the target absent condition

Value

A dataframe containing ln of the variance of the diagnosticity ratio for each lineup.

References

Malpass, R. S. (1981). Effective size and defendant bias in eyewitness identification lineups. *Law and Human Behavior, 5*(4), 299-309.

Malpass, R. S., Tredoux, C., & McQuiston-Surrett, D. (2007). Lineup construction and lineup fairness. In R. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Handbook of Eyewitness Psychology, Vol. 2: Memory for people* (pp. 155-178). Mahwah, NJ: Lawrence Erlbaum Associates.

Tredoux, C. G. (1998). Statistical inference on measures of lineup fairness. *Law and Human Behavior, 22*(2), 217-237.

Tredoux, C. (1999). Statistical considerations when determining measures of lineup size and lineup bias. *Applied Cognitive Psychology*, 13, S9-S26.

Wells, G. L.,Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior, 3*(4), 285-293.

Examples

```
#Target present data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_pres_list <- list(A, B, C)
rm(A, B, C)


#Target absent data:
A <-  round(runif(100,1,6))
B <-  round(runif(70,1,5))
C <-  round(runif(20,1,4))
lineup_abs_list <- list(A, B, C)
rm(A, B, C)
```

```
#Pos list
lineup1_pos <- c(1, 2, 3, 4, 5, 6)
lineup2_pos <- c(1, 2, 3, 4, 5)
lineup3_pos <- c(1, 2, 3, 4)
pos_list <- list(lineup1_pos, lineup2_pos, lineup3_pos)
rm(lineup1_pos, lineup2_pos, lineup3_pos)

#Nominal size:
k <- c(6, 5, 4)

#Use diag param helper function to get data (n11, n21, n12, n22):
linedf <- diag_param(lineup_pres_list, lineup_abs_list, pos_list, k)
#Call:
var <- var_lnd(linedf)
```

Index