

Package ‘sdtalt’

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Title Signal detection theory and alternatives

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sdtalt-package

SDT statistics and Alternatives ~~ sdtalt ~~

Description

Allows users, via sdt, to calculate several statistics (including user defined ones) from signal detection theory for each individual and summary statistics (mean, trimmed mean, standard deviation, including confidence intervals). The user may include covariates with the mlmsdt function.

Details

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Author(s)

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References

Wright, D.B., Horry, R., & Skagerberg, E.M. (2009). Functions for traditional and multilevel approaches to signal detection theory. *Behavior Research Methods*, 41, 257-267.

confcontr*Skagerberg and Wright (2008) control*

Description

These are the data from the control group in Skagerberg and Wright's study of memory conformity. Basically, this is the simplest old/new recognition memory design.

Usage

data(confcontr)

Format

A data frame with 3100 observations on the following 3 variables.

subno a numeric vector

sayold a numeric vector

isold a numeric vector

References

Skagerberg, E. M. & Wright, D. B. (2008). Manipulating power can affect memory conformity. *Applied Cognitive Psychology*, 22, 207-216.

Examples

```
data(confcontr)
```

confexp

Skagerberg & Wright (2008) Experimental

Description

Data from the conditions receiving either the low or high power task in Skagerberg and Wright's study of memory conformity.

Usage

```
data(confexp)
```

Format

A data frame with 5200 observations on the following 5 variables.

task a numeric vector

partno a numeric vector

other a numeric vector

old a numeric vector

sayold a numeric vector

References

Skagerberg, E. M. & Wright, D. B. (2008). Manipulating power can affect memory conformity. *Applied Cognitive Psychology*, 22, 207-216.

Examples

```
data(confexp)
```

face4

Horry and Wright's (2008) data

Description

Horry and Wright's study of the cross race context effect.

Usage

```
data(face4)
```

Format

A data frame with 45 observations on the following 5 variables.

subno a numeric vector

hits a numeric vector

fa a numeric vector

misses a numeric vector

cr a numeric vector

References

Horry, R. & Wright, D.B. (2008). I know your face but not where I saw you: Context memory is impaired for other race faces. *Psychonomic Bulletin & Review*, 15, 610-614.

Examples

```
data(face4)
```

face4b

Horry and Wright (2008) Black faces

Description

Data for the Black faces only from Horry and Wright (2008)

Usage

```
data(face4b)
```

Format

A data frame with 45 observations on the following 5 variables.

subno a numeric vector

hits a numeric vector

fa a numeric vector

misses a numeric vector

cr a numeric vector

References

Horry, R. & Wright, D.B. (2008). I know your face but not where I saw you: Context memory is impaired for other race faces. *Psychonomic Bulletin & Review*, 15, 610-614.

Examples

```
data(face4b)
```

face4w

Horry and Wright (2008) - White

Description

Data from Horry and Wright for White faces only

Usage

```
data(face4w)
```

Format

A data frame with 45 observations on the following 5 variables.

subno a numeric vector

hits a numeric vector

fa a numeric vector

misses a numeric vector

cr a numeric vector

References

Horry, R. & Wright, D.B. (2008). I know your face but not where I saw you: Context memory is impaired for other race faces. *Psychonomic Bulletin & Review*, 15, 610-614.

facec

Horry and Wright (2008)

Description

Data from Horry and Wright's study of the cross race context effect

Usage

```
data(facec)
```

Format

A data frame with 7200 observations on the following 4 variables.

participant a numeric vector

facewhite a numeric vector

seenbefore a numeric vector

sayold a numeric vector

References

Horry, R. & Wright, D.B. (2008). I know your face but not where I saw you: Context memory is impaired for other race faces. *Psychonomic Bulletin & Review*, 15, 610-614.

fne

Fear of negative evaluation and memory conformity

Description

These data compare fear of negative evaluation with memory conformity using a social recognition memory procedure.

Usage

```
data(fne)
```

Format

A data frame with 4288 observations on the following 6 variables.

id a numeric vector

FNE a numeric vector

face a numeric vector

sayold a numeric vector

isold a numeric vector

other a numeric vector

References

Wright, D.B., London, K., & Waechter, M. (under review). Memory conformity and social anxiety among a sample of adolescents.

format2to4	<i>Changes data for sdt to mlmsdt form</i>
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Description

Takes three variables (subject number, whether an item is old, and what the person says) and changes it into a dataframe with hits, false alarms, misses and correct rejections for each subject.

Usage

```
format2to4(subno, isold, sold, cnames = c("subno", "hits", "fas", "misses", "crs"), ...)
```

Arguments

subno	unique subject number for each individual
isold	whether the item is old - higher number old
sold	whether the person saysold - higher number old
cnames	5 names for the output dataframe
...	other parameters passed

Value

An nx5 dataframe

Author(s)

Daniel B. Wright

References

Wright, D.B., Horry, R., & Skagerberg, E.M. (2009). Functions for traditional and multilevel approaches to signal detection theory. *Behavior Research Methods*, 41, 257-267.

Examples

```
madeup <- data.frame(rep(1:10,each=10),rep(0:1,50),rbinom(100,1,.5))
colnames(madeup) <- c("subno","isold","sayold")
madeup[1:5,]
madeup4 <- format2to4(madeup[,1],madeup[,2],madeup[,3])
madeup4
```

format4to2

Changes data for sdt to data for mlmsdt

Description

Changes data in the form of hits, false alarms, misses, and correct rejections (which is suitable for the sdt function) for each individual into a file with one trial per like suitable for mlmsdt. See Wright, Horry and Skagerberg (in press, Behavior Research Methods).

Usage

```
format4to2(x, cnames = c("subno", "isold", "saysold"), code = 0.5, ...)
```

Arguments

x	dataframe with subject number, hits, false alarms, misses, and CR
cnames	names to output
code	code for isold and saysold
...	other parameters passed

Details

code - default is -.5 for new and +.5 for old for isold. Put 1 in for 0 and 1. saysold is 0 and 1

Value

A three column dataframe with length equal the number of trials is produced.

Author(s)

Daniel B. Wright

References

Wright, D.B., Horry, R., & Skagerberg, E.M. (2009). Functions for traditional and multilevel approaches to signal detection theory. Behavior Research Methods, 41, 257-267.

Examples

```
format4 <- rbinom(100,25,.5)
dim(format4) <- c(25,4)
format4 <- cbind(1:25,format4)
dim(format4)
format4[1:5,]
format2 <- format4to2(format4)
dim(format2)
format2[1:5,]
```

mlmsdt

*Using multilevel modeling for repeated 2x2 tables***Description**

Using Bates' lme4 package (2007) to run multilevel generalized linear models as an alternative to the traditional approaches to sdt. Details in Wright, Horry and Skagerberg (2009).

Usage

```
mlmsdt(subno, isold, sold, covs = NULL, lk = "logit", vardiff = TRUE, modify = TRUE, int = FALSE, item = N
```

Arguments

subno	unique subject number for each individual
isold	whether the person says old (1) or new (0)
sold	whether the item is old (1) or new (0)
covs	a list of covariates
lk	link function, default = "logit" but any that can be used in lmer
vardiff	whether to allow different variances for old and new items
modify	used for centering covariates
int	to look at interactions among covariates
item	if item numbers available, a random intercept for them included
...	other parameters can be passed

Details

subno - if only one unique subno is found, the function singlelevel is run. This is because lmer requires more than one subject. isold and sold - the assumption is that these have the old values higher than the low values, but as long as they are in the same direction the d' and lnOR output will be fine. The 0/1 dummy variable coding is for ease of interpreting the coefficients. modify also affects these. lk - it is assumed only logit and probit are used, so the output is designed for this but others can be used. item - this allows you to run item response models. Baayen et al. (2008) is worth consulting if using this. More complex models can be run accessing the lmer function directly.

Value

Output to the screen includes values for diagnosticity (lnOR or d'). An S4 object is created/

Author(s)

Daniel B. Wright

References

Baayen, R.H., Davidson, D.J., & Bates, D.M. (2008). Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language*. Bates, D. (2007). lme4: Linear mixed-effects models using S4 classes. Version 0.99875-9. Wright, D.B., Horry, R., & Skagerberg, E.M. (2009). Functions for traditional and multilevel approaches to signal detection theory. *Behavior Research Methods*, 41, 257-267.

Examples

```
id <- rep(1:10,each=10)
isold <- rbinom(100,1,.5)
covariate <- runif(100,0,.3)
item <- rep(1:10,10)
sayold <- rbinom(100,1,isold/4+covariate+item/50+id/50)
mlmsdt(id,isold,sayold,covariate,item=item)
```

sdt

Measures from SDT

Description

Several statistics from signal detection theory are calculated for each individual. The user can define their own, too. Summary statistics (mean, trimmed mean, standard deviation) for the sample can be calculated and BCa confidence intervals produced.

Usage

```
sdt(hits, fas, misses, cr, flat = 0, pmeans = FALSE, meas = "all", wk = 0.5, runboot = FALSE, trim = 0, R =
```

Arguments

hits	vector of hits
fas	vector of false alarms
misses	vector of misses
cr	vector of correct rejections
flat	value added to all cells, default = 0, .5 is common
pmeans	print the means and standard deviations
meas	which measures. See below. Default is all 15.
wk	if kappa used, the weighting value
runboot	whether to run bootstrap for BCa confidence intervals
trim	how much to trim the means. Default = 0, .2 is common
R	how many replicates for the bootstrap. Default = 2000.
confl	confidence level for intervals, between 0 and .999
newst	name of any user-defined statistic is to be used. See below.
bound	whether to bound infinite value to nearest finite value.
...	other parameters passed to the function

Details

meas can take a list of up to 15 statistics. HR Hit rate FAR False alarm rate d' csdt C A A' B B'
lnbeta lnbeta beta beta OR Odds ratio lnOR lnOR kappa Weighted kappa phi phi Q Yule's Q eta
Choice-theory measure eta PC Proportion correct newst is the name of a user-defined statistic that
must have 4 arguments, for hits, false alarms, misses, and correct rejections, in this order. If any
user wants a statistics added to this function, please contact Dan Wright.

Value

If pmeans=TRUE then sample statistics are printed to screen. A dataframe of the same length as
input is created with statistics for each of those listed in the meas option (15 by default).

Author(s)

Daniel B. Wright

References

Wright, D.B., Horry, R., & Skagerberg, E.M. (2009). Functions for traditional and multilevel ap-
proaches to signal detection theory. *Behavior Research Methods*, 41, 257-267.

Examples

```
hits <- rbinom(100,25,.6)
fa <- rbinom(100,25,.2)
miss <- rbinom(100,25,.4)
cr <- rbinom(100,25,.7)
sdtout <- sdt(hits,fa,miss,cr)
sdtout[1:3,]
sdt(hits,fa,miss,cr,meas=c("d","A"))
sdt(hits,fa,miss,cr,meas=c("d","A"),flat=.5)
HC <- function(hits,fas,misses,cr)
  return((hits+cr-fas-misses)/(hits+cr+fas+misses))
HCsqrt <- function(hits,fas,misses,cr)
  return(sqrt((hits+cr-fas-misses)/(hits+cr+fas+misses)))
HCstats <- sdt(hits,fa,miss,cr, meas={},newst=c(HC,HCsqrt))
HCstats[1:3,]
sdt(hits,fa,miss,cr, meas=c("d","A"), pmeans=TRUE)
sdt(hits,fa,miss,cr,meas=c("d","A"), pmeans=TRUE,trim=.2)
sdt(hits,fa,miss,cr, meas=c("A"),pmeans=TRUE,trim=.2,runboot=TRUE,conf1=.90)
```

Description

Called by mlmsdt when only a single unique subject number is in the data file. It is assumed this is
not called directly by users (use glm instead).

Usage

```
singlelevel(isold, sold, covs = {  
  }, lk = "logit", int = FALSE, modify = TRUE)
```

Arguments

isold	whether item is old or new
sold	whether person says old or new
covs	list of covariates
lk	link function, "probit" or "logit" usually
int	interactions between covariates
modify	centering covariates and -5, +.5 coding for isold

Value

a glm.object is returned and values for d' or lnOR printed to screen

Author(s)

Daniel. B. Wright

Examples

```
x <- runif(100,0,1)  
singlelevel(rbinom(100,1,x),rbinom(100,1,x))
```

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