

# Package ‘ufs’

January 8, 2021

**Type** Package

**Title** Quantitative Analysis Made Accessible

**Version** 0.4.1

**Maintainer** Gjalt-Jorn Peters <gjalt-jorn@userfriendlyscience.com>

**License** GPL (>= 3)

**Description** This is a new version of the 'userfriendlyscience' package, which has grown a bit unwieldy. Therefore, distinct functionalities are being 'consciously uncoupled' into different packages. This package contains the general-purpose tools and utilities (see the 'behaviorchange' package, the 'rosetta' package, and the soon-to-be-released 'scd' package for other functionality), and is the most direct 'successor' of the original 'userfriendlyscience' package. For example, this package contains a number of basic functions to create higher level plots, such as diamond plots, to easily plot sampling distributions, to generate confidence intervals, to plan study sample sizes for confidence intervals, and to do some basic operations such as (dis)attenuate effect size estimates.

**URL** <https://r-packages.gitlab.io/ufs>

**BugReports** <https://gitlab.com/r-packages/ufs/-/issues>

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.1.1

**Depends** R (>= 3.0.0)

**Suggests** bootES (>= 1.2), car (>= 3.0), careless (>= 1.1), GGally (>= 1.4.0), jmvcore (>= 1.2), lavaan (>= 0.6), MBESS (>= 4.5.1), psych (>= 1.8), rio (>= 0.5), remotes (>= 0.2), rmarkdown (>= 2.5), rstudioapi (>= 0.11)

**Imports** digest (>= 0.6.19), diptest (>= 0.75.7), dplyr (>= 0.7.6), ggplot2 (>= 2.2.1), ggrepel (>= 0.8), ggridges (>= 0.5.0), grDevices (>= 3.0.0), gridExtra (>= 2.3), gtable (>= 0.2.0), htmltools (>= 0.4.0), kableExtra (>= 1.1.0), knitr (>= 1.22), pandoc (>= 0.6.3), plyr (>= 1.8.4), rmdpartials (>= 0.5.8), scales (>= 1.0.0), SuppDists (>= 1.1.9), viridis (>= 0.5.1)

**NeedsCompilation** no

**Author** Gjalt-Jorn Peters [aut, cre] (<<https://orcid.org/0000-0002-0336-9589>>),  
Stefan Gruijters [ctb] (<<https://orcid.org/0000-0003-0141-0071>>)

**Repository** CRAN

**Date/Publication** 2021-01-08 18:00:02 UTC

## R topics documented:

aipedjmv	4
aiperjmv	4
areColors	5
arr	6
associationMatrix	7
associationsDiamondPlot	10
attenuate.d	12
attenuate.r	13
A_VarghaDelaney	14
bfi-data	15
biAxisDiamondPlot	15
biDimColors	18
carelessObject	18
carelessReport	19
cat0	20
checkPkgs	21
CIM	22
cohensdCI	25
computeStatistic_t	28
confintdjmv	30
confIntOmegaSq	30
confIntProp	32
confIntR	33
confintrjmv	34
confIntSD	35
convert	36
convert.cer.to.d	37
convert.d.to.U3	39
convertToNumeric	39
cramersV	40
dataShape	41
descr	45
diamondCoordinates	47
diamondPlot	51
disattenuate.d	53
disattenuate.r	54
duoComparisonDiamondPlot	54
escapeRegex	58
exportToHTML	59

extractVarName . . . . .	60
faConfInt . . . . .	61
factorLoadingDiamondCIplot . . . . .	62
factorLoadingHeatmap . . . . .	63
fa_failsafe . . . . .	65
findShortestInterval . . . . .	66
formatCI . . . . .	67
formatPvalue . . . . .	68
formatR . . . . .	69
getData . . . . .	69
ggBarChart . . . . .	71
ggBoxplot . . . . .	72
ggEasyBar . . . . .	73
ggProportionPlot . . . . .	75
ggqq . . . . .	79
ggSave . . . . .	80
heading . . . . .	81
ifelseObj . . . . .	82
insertFigureCaption . . . . .	83
iqrOutlier . . . . .	84
irpplot . . . . .	85
is.nr . . . . .	86
is.odd . . . . .	86
isTrue . . . . .	87
kbIXtra . . . . .	88
knitAndSave . . . . .	89
knitFig . . . . .	90
makeScales . . . . .	91
massConvertToNumeric . . . . .	92
meanConfInt . . . . .	93
meansDiamondPlot . . . . .	94
meansDiamondPlotjmv . . . . .	96
meanSDtoDiamondPlot . . . . .	97
multiResponse . . . . .	99
multiResponsejmv . . . . .	100
multiVarFreq . . . . .	101
normalHist . . . . .	102
noZero . . . . .	104
opts . . . . .	104
pomegaSq . . . . .	105
pwr.bootES . . . . .	107
pwr.confIntProp . . . . .	108
pwr.confIntR . . . . .	109
quietRemotesInstall . . . . .	110
qVec . . . . .	111
regrInfluential . . . . .	112
repeatStr . . . . .	113
report . . . . .	113

safeRequire . . . . .	114
scaleDiagnosis . . . . .	114
scaleStructure . . . . .	117
scatterMatrix . . . . .	121
setCaptionNumberingKnitrHook . . . . .	123
sharedSubString . . . . .	124
spearmanBrown . . . . .	125
strToFilename . . . . .	126
suspectParticipants . . . . .	126
testRetestSimData . . . . .	127
vecTxt . . . . .	128
zotero_construct_export_call . . . . .	129
zotero_download_and_export_items . . . . .	130
zotero_get_all_items . . . . .	131
zotero_nr_of_items . . . . .	132
%IN% . . . . .	132

**Index** **133**

---

aipedjmv *Sample size for accuracy: d*

---

**Description**

Sample size for accuracy: d

**Usage**

```
aipedjmv(d = 0.5, w = 0.1, conf.level = 95)
```

**Arguments**

d	.
w	.
conf.level	.

**Value**

A results object containing:

results\$text	a html
results\$aipPlot	an image

---

aiperjmv *Sample size for accuracy: r*

---

**Description**

Sample size for accuracy: r

**Usage**

```
aiperjmv(r = 0.3, w = 0.1, conf.level = 95)
```

**Arguments**

```
r          .
w          .
conf.level .
```

**Value**

A results object containing:

results\$text	a html
results\$aipePlot	an image

---

areColors

---

*Check whether elements of a vector are valid colors*


---

**Description**

This function by Josh O'Brien checks whether elements of a vector are valid colors. It has been copied from a Stack Exchange answer (see <https://stackoverflow.com/questions/13289009/check-if-character-string-is-a-valid-color-representation>).

**Usage**

```
areColors(x)
```

**Arguments**

```
x          The vector.
```

**Value**

A logical vector.

**Author(s)**

Josh O'Brien

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**Examples**

```
ufs::areColors(c(NA, "black", "blackk", "1", "#00", "#000000"));
```

---

arr

*Absolute Relative Risk and confidence interval*


---

**Description**

This is a function to conveniently and quickly compute the absolute relative risk (ARR) and its confidence interval.

**Usage**

```
arr(
  expPos,
  expN,
  conPos,
  conN,
  conf.level = 0.95,
  digits = 2,
  printAsPercentage = TRUE
)
```

```
## S3 method for class 'ufsARR'
print(x, digits = x$digits, printAsPercentage = x$printAsPercentage, ...)
```

**Arguments**

expPos	Number of positive events in the experimental condition.
expN	Total number of cases in the experimental condition.
conPos	Number of positive events in the control condition.
conN	Total number of cases in the control condition.
conf.level	The confidence level for the confidence interval.
digits	The number of digits to round to when printing the results.
printAsPercentage	Whether to multiply with 100 when printing the results.
x	The result of the call to arr.
...	Any additional arguments are neglected.

**Value**

An object with in estimate, the ARR, and in conf.int, the confidence interval.

**Examples**

```
ufs::arr(10, 60, 20, 60);
```

---

```
associationMatrix      associationMatrix
```

---

**Description**

associationMatrix produces a matrix with confidence intervals for effect sizes, point estimates for those effect sizes, and the p-values for the test of the hypothesis that the effect size is zero, corrected for multiple testing.

**Usage**

```
associationMatrix(
  dat = NULL,
  x = NULL,
  y = NULL,
  conf.level = 0.95,
  correction = "fdr",
  bootstrapV = FALSE,
  info = c("full", "ci", "es"),
  includeSampleSize = "depends",
  bootstrapV.samples = 5000,
  digits = 2,
  pValueDigits = digits + 1,
  colNames = FALSE,
  type = c("R", "html", "latex"),
  file = "",
  statistic = associationMatrixStatDefaults,
  effectSize = associationMatrixESDefaults,
  var.equal = TRUE
)

## S3 method for class 'associationMatrix'
print(x, type = x$input$type, info = x$input$info, file = x$input$file, ...)

## S3 method for class 'associationMatrix'
pander(x, info = x$input$info, file = x$input$file, ...)
```

**Arguments**

**dat** A dataframe with the variables of interest. All variables in this dataframe will be used if both x and y are NULL. If dat is NULL, the user will be presented with a dialog to select a datafile.

<code>x</code>	If not NULL, this should be a character vector with the names of the variables to include in the rows of the association table. If <code>x</code> is NULL, all variables in the dataframe will be used.
<code>y</code>	If not NULL, this should be a character vector with the names of the variables to include in the columns of the association table. If <code>y</code> is NULL, the variables in <code>x</code> will be used for the columns as well (which produces a symmetric matrix, similar to most correlation matrices).
<code>conf.level</code>	Level of confidence of the confidence intervals.
<code>correction</code>	Correction for multiple testing: an element out of the vector <code>c("holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none")</code> . NOTE: the p-values are corrected for multiple testing; The confidence intervals are not!
<code>bootstrapV</code>	Whether to use bootstrapping to compute the confidence interval for Cramer's V or whether to use the Fisher's Z conversion.
<code>info</code>	Information to print: either both the confidence interval and the point estimate for the effect size (and the p-value, corrected for multiple testing), or only the confidence intervals, or only the point estimate (and the corrected p-value). Must be an element of the vector <code>c("full", "ci", "es")</code> .
<code>includeSampleSize</code>	Whether to include the sample size when the effect size point estimate and p-value are shown. If this is "depends", it will depend on whether all associations have the same sample size (and the sample size will only be printed when they don't). If "always", the sample size will always be added. If anything else, it will never be printed.
<code>bootstrapV.samples</code>	If using bootstrapping for Cramer's V, the number of samples to generate.
<code>digits</code>	Number of digits to round to when printing the results.
<code>pValueDigits</code>	How many digits to use for formatting the p values.
<code>colNames</code>	If true, the column heading will use the variables names instead of numbers.
<code>type</code>	Type of output to generate: must be an element of the vector <code>c("R", "html", "latex")</code> .
<code>file</code>	If a file is specified, the output will be written to that file instead of shown on the screen.
<code>statistic</code>	This is the complicated bit; this is where <code>associationMatrix</code> allows customization of the used statistics to perform null hypothesis significance testing. For everyday use, leaving this at the default value, <code>associationMatrixStatDefaults</code> , works fine. In case you want to customize, read the 'Notes' section below.
<code>effectSize</code>	Like the 'statistics' argument, 'effectSize' also allows customization, in this case of the used effect sizes. Again, the default value, <code>associationMatrixESDefaults</code> , works for everyday use. Again, see the 'Notes' section below if you want to customize.
<code>var.equal</code>	Whether to test for equal variances ('test'), assume equality ('yes'), or assume inequality ('no').
<code>...</code>	Additional arguments are passed on to the <code>print()</code> and <code>pander::pander()</code> functions.



**Value**

An object with the input and several output variables, one of which is a dataframe with the association matrix in it. When this object is printed, the association matrix is printed to the screen. If the 'file' parameter is specified, a file with this matrix will also be written to disk.

**Note**

The 'statistic' and 'effectSize' parameter make it possible to use different functions to conduct null hypothesis significance testing and compute effect sizes. In both cases, the parameter needs to be a list containing four lists, named 'dichotomous', 'nominal', 'ordinal', and 'interval'. Each of these lists has to contain four elements, character vectors of length one (i.e. just one string value), again named 'dichotomous', 'nominal', 'ordinal', and 'interval'.

The combination of each of these names (e.g. 'dichotomous' and 'nominal', or 'ordinal' and 'interval', etc) determine which test should be done when computing the p-value to test the association between two variables of those types, or which effect sizes to compute. When called, associationMatrix determines the measurement levels of the relevant variables. It then uses these two levels (their string representation, e.g. 'dichotomous' etc) to find a string in the 'statistic' and 'effectSize' objects. Two functions with these names are then called from two lists, 'computeStatistic' and computeEffectSize. These lists list contain functions that have the same names as the strings in the 'statistic' list.

For example, when the default settings are used, the string (function name) found for two dichotomous variables when searching in associationMatrixStatDefaults is 'chisq', and the string found in associationMatrixESDefaults is 'v'. associationMatrix then calls computeStatistic[['chisq']] and computeEffectSize[['v']], providing the two variables as arguments, as well as passing the 'conf.level' argument. These two functions then each return an object that associationMatrix extracts the information from. Inspect the source code of these functions (by typing their names without parentheses in the R prompt) to learn how this object should look, if you want to write your own functions.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**Examples**

```
### Generate a simple association matrix using all three variables in the
### Orange tree dataframe
associationMatrix(Orange);

### Or four variables from infert:
associationMatrix(infert, c("education", "parity",
                           "induced", "case"), colNames=TRUE);

### Use variable names in the columns and generate html
associationMatrix(Orange, colNames=TRUE, type='html');
```

---

 associationsDiamondPlot

*A diamondplot with confidence intervals for associations*


---

### Description

This function produces a diamondplot that plots the confidence intervals for associations between a number of covariates and a criterion. It currently only supports the Pearson's  $r$  effect size metric; other effect sizes are converted to Pearson's  $r$ .

### Usage

```

associationsDiamondPlot(
  dat,
  covariates,
  criteria,
  labels = NULL,
  criteriaLabels = NULL,
  decreasing = NULL,
  sortBy = NULL,
  conf.level = 0.95,
  criteriaColors = viridis::viridis(length(criteria)),
  criterionColor = "black",
  returnLayerOnly = FALSE,
  esMetric = "r",
  multiAlpha = 0.33,
  singleAlpha = 1,
  showLegend = TRUE,
  xlab = "Effect size estimates",
  ylab = "",
  theme = ggplot2::theme_bw(),
  lineSize = 1,
  outputFile = NULL,
  outputWidth = 10,
  outputHeight = 10,
  ggsaveParams = ufs::opts$get("ggsaveParams"),
  ...
)

associationsToDiamondPlotDf(
  dat,
  covariates,
  criterion,
  labels = NULL,
  decreasing = NULL,

```

```

    conf.level = 0.95,
    esMetric = "r"
  )

```

### Arguments

<code>dat</code>	The dataframe containing the relevant variables.
<code>covariates</code>	The covariates: the list of variables to associate to the criterion or criteria, usually the predictors.
<code>criteria, criterion</code>	The criteria, usually the dependent variables; one criterion (one dependent variable) can also be specified of course. The helper function <code>associationsToDiamondPlotDf</code> always accepts only one criterion.
<code>labels</code>	The labels for the covariates, for example the questions that were used (as a character vector).
<code>criteriaLabels</code>	The labels for the criteria (in the legend).
<code>decreasing</code>	Whether to sort the covariates by the point estimate of the effect size of their association with the criterion. Use <code>NULL</code> to not sort at all, <code>TRUE</code> to sort in descending order, and <code>FALSE</code> to sort in ascending order.
<code>sortBy</code>	When specifying multiple criteria, this can be used to indicate by which criterion the items should be sorted (if they should be sorted).
<code>conf.level</code>	The confidence of the confidence intervals.
<code>criteriaColors, criterionColor</code>	The colors to use for the different associations can be specified in <code>criteriaColors</code> . This should be a vector of valid colors with at least as many elements as criteria are specified in <code>criteria</code> . If only one criterion is specified, the color in <code>criterionColor</code> is used.
<code>returnLayerOnly</code>	Whether to return the entire object that is generated, or just the resulting <code>ggplot2</code> layer.
<code>esMetric</code>	The effect size metric to plot - currently, only 'r' is supported, and other values will return an error.
<code>multiAlpha, singleAlpha</code>	The transparency (alpha channel) value of the diamonds for each association can be specified in <code>multiAlpha</code> , and if only one criterion is specified, the alpha level of the diamonds can be specified in <code>singleAlpha</code> .
<code>showLegend</code>	Whether to show the legend.
<code>xlab, ylab</code>	The label to use for the x and y axes (for <code>duoComparisonDiamondPlot</code> , must be vectors of two elements). Use <code>NULL</code> to not use a label.
<code>theme</code>	The <code>ggplot()</code> theme to use.
<code>lineSize</code>	The thickness of the lines (the diamonds' strokes).
<code>outputFile</code>	A file to which to save the plot.
<code>outputWidth, outputHeight</code>	Width and height of saved plot (specified in centimeters by default, see <code>ggsaveParams</code> ).
<code>ggsaveParams</code>	Parameters to pass to <code>ggsave</code> when saving the plot.
<code>...</code>	Any additional arguments are passed to <code>diamondPlot()</code> and eventually to <code>ggDiamondLayer()</code> .

**Details**

associationsToDiamondPlotDf is a helper function that produces the required dataframe.

This function can be used to quickly plot multiple confidence intervals.

**Value**

A plot.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

[diamondPlot\(\)](#), [ggDiamondLayer\(\)](#)

**Examples**

```
### Simple diamond plot with correlations
### and their confidence intervals

associationsDiamondPlot(mtcars,
  covariates=c('cyl', 'hp', 'drat', 'wt',
              'am', 'gear', 'vs', 'carb', 'qsec'),
  criteria='mpg');

### Same diamond plot, but now with two criteria,
### and colouring the diamonds based on the
### correlation point estimates: a gradient
### is created where red is used for -1,
### green for 1 and blue for 0.

associationsDiamondPlot(mtcars,
  covariates=c('cyl', 'hp', 'drat', 'wt',
              'am', 'gear', 'vs', 'carb', 'qsec'),
  criteria=c('mpg', 'disp'),
  generateColors=c("red", "blue", "green"),
  fullColorRange=c(-1, 1));
```

**Description**

Measurement error (i.e. the complement of reliability) results in a downward bias of observed effect sizes. This attenuation can be emulated by this function.

**Usage**

```
attenuate.d(d, reliability)
```

**Arguments**

`d` The value of Cohen's  $d$  (that would be obtained with perfect measurements)  
`reliability` The reliability of the measurements of the continuous variable

**Value**

The attenuated value of Cohen's  $d$

**Author(s)**

Gjalt-Jorn Peters & Stefan Gruijters

**References**

Bobko, P., Roth, P. L., & Bobko, C. (2001). Correcting the Effect Size of  $d$  for Range Restriction and Unreliability. *Organizational Research Methods*, 4(1), 46–61. doi: [10.1177/109442810141003](https://doi.org/10.1177/109442810141003)

**Examples**

```
attenuate.d(.5, .8);
```

---

attenuate.r *Attenuate a Pearson's  $r$  estimate for unreliability in the measurements*

---

**Description**

Attenuate a Pearson's  $r$  estimate for unreliability in the measurements

**Usage**

```
attenuate.r(r, reliability1, reliability2)
```

**Arguments**

`r` The (disattenuated) value of Pearson's  $r$   
`reliability1, reliability2`  
The reliabilities of the two variables

**Value**

The attenuated value of Pearson's  $r$

**Examples**

```
attenuate.r(.5, .8, .9);
```

---

A\_VarghaDelaney

*Vargha & Delaney's A*

---

**Description**

Vargha & Delaney's A

**Usage**

```
A_VarghaDelaney(  
  control,  
  experimental,  
  bootstrap = NULL,  
  conf.level = 0.95,  
  warn = FALSE  
)
```

**Arguments**

control	A vector with the data for the control condition.
experimental	A vector with the data from the experimental condition.
bootstrap	The number of bootstrap samples to use to compute confidence intervals, or NULL to not compute confidence intervals.
conf.level	The confidence level of the confidence intervals.
warn	Whether to allow the <code>stats::wilcox.test()</code> function to emit warnings, for example if ties are encountered.

**Value**

A numeric vector of length 1 with the A value, named 'A'.

**Examples**

```
ufs::A_VarghaDelaney(1:8, 3:12);
```

---

bfi-data	<i>25 Personality items representing 5 factors</i>
----------	--

---

**Description**

This is a dataset lifted from the psychTools package (which was originally in the psych package). For details, please check that help page (using "psychTools::bfi").

**Usage**

```
data(bfi)
```

**Format**

A data.frame with 2800 rows and 28 columns.

**Examples**

```
data(bfi);
```

---

biAxisDiamondPlot	<i>Diamondplot with two Y axes</i>
-------------------	------------------------------------

---

**Description**

This is basically a `meansDiamondPlot()`, but extended to allow specifying subquestions and anchors at the left and right side. This is convenient for psychological questionnaires when the anchors or dimensions were different from item to item. This function is used to function the left panel of the `behaviorchange::CIBER()` plot.

**Usage**

```
biAxisDiamondPlot(  
  dat,  
  items = NULL,  
  leftAnchors = NULL,  
  rightAnchors = NULL,  
  subQuestions = NULL,  
  decreasing = NULL,  
  conf.level = 0.95,  
  showData = TRUE,  
  dataAlpha = 0.1,  
  dataColor = "#444444",  
  diamondColors = NULL,  
  jitterWidth = 0.45,  
  jitterHeight = 0.45,
```

```

xbreaks = NULL,
xLabels = NA,
xAxisLab = paste0("Scores and ", round(100 * conf.level, 2), "% CIs"),
drawPlot = TRUE,
returnPlotOnly = TRUE,
baseSize = 1,
dotSize = baseSize,
baseFontSize = 10 * baseSize,
theme = ggplot2::theme_bw(base_size = baseFontSize),
outputFile = NULL,
outputWidth = 10,
outputHeight = 10,
ggsaveParams = ufs::opts$get("ggsaveParams"),
...
)

```

### Arguments

<code>dat</code>	The dataframe containing the variables.
<code>items</code>	The variables to include.
<code>leftAnchors</code>	The anchors to display on the left side of the left hand panel. If the items were measured with one variable each, this can be used to show the anchors that were used for the respective scales. Must have the same length as <code>items</code> .
<code>rightAnchors</code>	The anchors to display on the right side of the right hand panel. If the items were measured with one variable each, this can be used to show the anchors that were used for the respective scales. Must have the same length as <code>items</code> .
<code>subQuestions</code>	The subquestions used to measure each item. This can also be used to provide pretty names for the variables if the items were not measured by one question each. Must have the same length as <code>items</code> .
<code>decreasing</code>	Whether to sort the items. Specify <code>NULL</code> to not sort at all, <code>TRUE</code> to sort in descending order, and <code>FALSE</code> to sort in ascending order.
<code>conf.level</code>	The confidence levels for the confidence intervals.
<code>showData</code>	Whether to show the individual datapoints.
<code>dataAlpha</code>	The alpha level (transparency) of the individual datapoints. Value between 0 and 1, where 0 signifies complete transparency (i.e. invisibility) and 1 signifies complete 'opaqueness'.
<code>dataColor</code>	The color to use for the individual datapoints.
<code>diamondColors</code>	The colours to use for the diamonds. If <code>NULL</code> , the <code>generateColors</code> argument can be used which will then be passed to <code>diamondPlot()</code> .
<code>jitterWidth</code>	How much to jitter the individual datapoints horizontally.
<code>jitterHeight</code>	How much to jitter the individual datapoints vertically.
<code>xbreaks</code>	Which breaks to use on the X axis (can be useful to override <code>ggplot()</code> 's defaults).
<code>xLabels</code>	Which labels to use for those breaks (can be useful to override <code>ggplot()</code> 's defaults; especially useful in combination with <code>xBreaks</code> of course).



xAxisLab	Axis label for the X axis.
drawPlot	Whether to draw the plot, or only return it.
returnPlotOnly	Whether to return the entire object that is generated (including all intermediate objects) or only the plot.
baseSize	This can be used to efficiently change the size of most plot elements.
dotSize	This is the size of the points used to show the individual data points in the left hand plot.
baseFontSize	This can be used to set the font size separately from the baseSize.
theme	This is the theme that is used for the plots.
outputFile	A file to which to save the plot.
outputWidth, outputHeight	Width and height of saved plot (specified in centimeters by default, see ggsaveParams).
ggsaveParams	Parameters to pass to ggsave when saving the plot.
...	These arguments are passed on to diamondPlot].

### Details

This is a diamondplot that can be used for items/questions where the anchors of the response scales could be different for every item. For the rest, it is very similar to [meansDiamondPlot\(\)](#).

### Value

Either just a plot (a [gtable::gtable\(\)](#) object) or an object with all produced objects and that plot.

### Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### See Also

[behaviorchange::CIBER\(\)](#), [associationsDiamondPlot\(\)](#)

### Examples

```
biAxisDiamondPlot(dat=mtcars,
  items=c('cyl', 'wt'),
  subQuestions=c('cylinders', 'weight'),
  leftAnchors=c('few', 'light'),
  rightAnchors=c('many', 'heavy'),
  xbreaks=0:8);
```

---

biDimColors	<i>Create colours for a response scale for an item</i>
-------------	--

---

**Description**

Create colours for a response scale for an item

**Usage**

```
biDimColors(start, mid, end, length, show = TRUE)
```

```
uniDimColors(start, end, length, show = TRUE)
```

**Arguments**

start	Color to start with
mid	Color in the middle, for bidimensional scales
end	Color to end with
length	The number of response options
show	Whether to show the colours

**Value**

The colours as hex codes.

**Examples**

```
uniDimColors("#000000", "#00BB00", length=5, show=FALSE);
```

---

carelessObject	<i>Compute diagnostics for careless responding</i>
----------------	--

---

**Description**

This function is a wrapper for the functions from the `careless` package. Normally, you'd probably call `carelessReport` which calls this function to generate a report of suspect participants.

**Usage**

```
carelessObject(
  data,
  items = names(data),
  flagUnivar = 0.99,
  flagMultivar = 0.95,
  irvSplit = 4,
  responseTime = NULL
)
```

**Arguments**

data	The dataframe.
items	The items to look at.
flagUnivar	How extreme a score has to be for it to be flagged as suspicious univariately.
flagMultivar	This has not been implemented yet.
irvSplit	Whether to split for the IRV, and if so, in how many parts.
responseTime	If not NULL, the name of a column containing the participants' response times.

**Value**

An object of class `carelessObject`.

**Examples**

```
carelessObject(mtcars);
```

---

carelessReport	<i>A report to help diagnosing careless responders</i>
----------------	--

---

**Description**

This function wraps functions from the `careless` package to help inspect and diagnose careless participants. It is optimized for using in R Markdown files.

**Usage**

```
carelessReport(  
  data,  
  items = names(data),  
  nFlags = 1,  
  flagUnivar = 0.99,  
  flagMultivar = 0.95,  
  irvSplit = 4,  
  headingLevel = 3,  
  datasetName = NULL,  
  responseTime = NULL,  
  headingSuffix = " {.tabset}",  
  digits = 2,  
  missingSymbol = "Missing"  
)
```

**Arguments**

data	The dataframe.
items	The items to look at.
nFlags	How many indicators need to be flagged for a participant to be considered suspect.
flagUnivar	How extreme a score has to be for it to be flagged as suspicious univariately.
flagMultivar	This has not been implemented yet.
irvSplit	Whether to split for the IRV, and if so, in how many parts.
headingLevel	The level of the heading in Markdown (the number of #s to include before the heading).
datasetName	The name of the dataset to display (to override, if desired).
responseTime	If not NULL, the name of a column containing the participants' response times.
headingSuffix	The suffix to include; by default, set such that the individual participants IRP plots are placed in separate tabs.
digits	The number of digits to round to.
missingSymbol	How to represent missing values.

**Value**

NULL, invisibly; and prints the report.

**Examples**

```
### Get the BFI data taken from the `psych` package
dat <- ufs::bfi;

### Get the variable names for the regular items
bfiVars <-
  setdiff(names(dat),
          c("gender", "education", "age"));

### Inspect suspect participants, very conservatively to
### limit the output (these are 2800 participants).
carelessReport(data = dat,
               items = bfiVars,
               nFlags = 5);
```

---

cat0

*Concatenate to screen without spaces*


---

**Description**

The cat0 function is to cat what paste0 is to paste; it simply makes concatenating many strings without a separator easier.

**Usage**

```
cat0(..., sep = "")
```

**Arguments**

...           The character vector(s) to print; passed to `cat`.

sep           The separator to pass to `cat`, of course, "" by default.

**Value**

Nothing (invisible NULL, like `cat`).

**Examples**

```
cat0("The first variable is '", names(mtcars)[1], "'.");
```

---

checkPkgs	<i>Check for presence of a package</i>
-----------	--

---

**Description**

This function efficiently checks for the presence of a package without loading it (unlike `library()` or `require()`). This is useful to force yourself to use the `package::function` syntax for addressing functions; you can make sure required packages are installed, but their namespace won't attach to the search path.

**Usage**

```
checkPkgs(
  ...,
  install = FALSE,
  load = FALSE,
  repos = "https://cran.rstudio.com"
)
```

**Arguments**

...           A series of packages. If the packages are named, the names are the package names, and the values are the minimum required package versions (see the second example).

install       Whether to install missing packages from `repos`.

load          Whether to load packages (which is exactly *not* the point of this package, but hey, YMMV).

repos         The repository to use if installing packages; default is the RStudio repository.

**Value**

Invisibly, a vector of the available packages.

**Examples**

```
ufs:::checkPkgs('base');

### Require a version
ufs:::checkPkgs(ufs = "0.3.1");

### This will show the error message
tryCatch(
  ufs:::checkPkgs(
    base = "99",
    stats = "42.5",
    ufs = 20
  ),
  error = print
);
```

---

CIM

*Conceptual Independence Matrix*

---

**Description**

Conceptual Independence Matrix

**Usage**

```
CIM(
  data,
  scales,
  conf.level = 0.95,
  colors = c("#440154FF", "#7AD151FF"),
  outputFile = NULL,
  outputWidth = 100,
  outputHeight = 100,
  outputUnits = "cm",
  faMethod = "minres",
  n.iter = 100,
  n.repeatOnWarning = 50,
  warningTolerance = 2,
  silentRepeatOnWarning = FALSE,
  showWarnings = FALSE,
  skipRegex = NULL,
  headingLevel = 2,
  printAbbreviations = TRUE,
  drawPlot = TRUE,
```

```

    returnPlotOnly = TRUE
  )

  CIM_partial(
    x,
    headingLevel = x$input$headingLevel,
    quiet = TRUE,
    echoPartial = FALSE,
    partialFile = NULL,
    ...
  )

  ## S3 method for class 'CIM'
  knit_print(
    x,
    headingLevel = x$input$headingLevel,
    quiet = TRUE,
    echoPartial = FALSE,
    partialFile = NULL,
    ...
  )

```

### Arguments

<code>data</code>	The dataframe containing the variables.
<code>scales</code>	The scales: a named list of character vectors, where the character vectors specify the variable names, and the names of each character vector specifies the relevant scale.
<code>conf.level</code>	The confidence level for the confidence intervals.
<code>colors</code>	The colors used for the factors. The default uses the discrete <code>viridis()</code> palette, which is optimized for perceptual uniformity, maintaining its properties when printed in grayscale, and designed for colourblind readers. A vector can also be supplied; the colors must be valid arguments to <code>colorRamp()</code> (and therefore, to <code>col2rgb()</code> ).
<code>outputFile</code>	The file to write the output to.
<code>outputWidth, outputHeight, outputUnits</code>	The width, height, and units for the output file.
<code>faMethod</code>	The method to pass on to <code>psych::fa()</code> .
<code>n.iter</code>	The number of iterations to pass on to <code>psych::fa()</code> .
<code>n.repeatOnWarning</code>	How often to repeat on warnings (in the hopes of getting a run without warnings).
<code>warningTolerance</code>	How many warnings are accepted.
<code>silentRepeatOnWarning</code>	Whether to be chatty or silent when repeating after warnings.

showWarnings	Whether to show the warnings.
skipRegex	A character vector of length 2 containing two regular expressions; if the two scales both match one or both of those regular expressions, that cell is skipped.
headingLevel	The level for the heading; especially useful when knitting an Rmd partial.
printAbbreviations	Whether to print a table with the abbreviations that are used.
drawPlot	Whether to draw the plot or only return it.
returnPlotOnly	Whether to return the plot only, or the entire object.
x	The object to print.
quiet	Whether to be quiet or chatty.
echoPartial	Whether to echo the code in the Rmd partial.
partialFile	Can be used to override the Rmd partial file.
...	Additional arguments are passed on the respective default methods.

### Value

A `ggplot2::ggplot()` plot.

### Examples

```
### Load dataset `bfi`, originally from psychTools package
data(bfi, package= 'ufs');

### Specify scales
bfiScales <-
  list(Agreeableness = paste0("Agreeableness_item_", 1:5),
       Conscientiousness = paste0("Conscientiousness_item_", 1:5),
       Extraversion = paste0("Extraversion_item_", 1:5),
       Neuroticism = paste0("Neuroticism_item_", 1:5),
       Openness = paste0("Openness_item_", 1:5));

names(bfi) <- c(unlist(bfiScales),
               c('gender', 'education', 'age'));

### Only select first two and the first three items to
### keep it quick; just pass the full 'bfiScales'
### object to run for all five the full scales

CIM(bfi,
    scales=lapply(bfiScales, head, 3)[1:2],
    n.iter=10);
```



---

cohensdCI                      *The distribution of Cohen's d*

---

### Description

These functions use some conversion to and from the  $t$  distribution to provide the Cohen's  $d$  distribution. There are four versions that act similar to the standard distribution functions (the  $d$ .,  $p$ .,  $q$ ., and  $r$ . functions, and their longer aliases `.Cohensd`), three convenience functions (`pdExtreme`, `pdMild`, and `pdInterval`), a function to compute the confidence interval for a Cohen's  $d$  estimate `cohensdCI`, and a function to compute the sample size required to obtain a confidence interval around a Cohen's  $d$  estimate with a specified accuracy (`pwr.cohensdCI` and its alias `pwr.confIntd`).

### Usage

```
cohensdCI(d, n, conf.level = 0.95, plot = FALSE, silent = TRUE)

dCohensd(
  x,
  df = NULL,
  populationD = 0,
  n = NULL,
  n1 = NULL,
  n2 = NULL,
  silent = FALSE
)

pCohensd(q, df, populationD = 0, lower.tail = TRUE)

qCohensd(p, df, populationD = 0, lower.tail = TRUE)

rCohensd(n, df, populationD = 0)

pdInterval(ds, n, populationD = 0)

pdExtreme(d, n, populationD = 0)

pdMild(d, n, populationD = 0)

pwr.cohensdCI(d, w = 0.1, conf.level = 0.95, extensive = FALSE, silent = TRUE)
```

### Arguments

<code>n, n1, n2</code>	Desired number of Cohen's $d$ values for <code>rCohensd</code> and <code>rd</code> ( $n$ ), and the number of participants/datapoints in total ( $n$ ) or in each group ( $n1$ and $n2$ ) for <code>dd</code> , <code>dCohensd</code> , <code>pdExtreme</code> , <code>pdMild</code> , <code>pdInterval</code> , and <code>cohensdCI</code> .
<code>conf.level</code>	The level of confidence of the confidence interval.

plot	Whether to show a plot of the sampling distribution of Cohen's $d$ and the confidence interval. This can only be used if specifying one value for <code>d</code> , <code>n</code> , and <code>conf.level</code> .
silent	Whether to provide FALSE or suppress (TRUE) warnings. This is useful because function 'qt', which is used under the hood (see <code>qt()</code> for more information), warns that 'full precision may not have been achieved' when the density of the distribution is very close to zero. This is normally no cause for concern, because with sample sizes this big, small deviations have little impact.
x, q, d	Vector of quantiles, or, in other words, the value(s) of Cohen's $d$ .
df	Degrees of freedom.
populationD	The value of Cohen's $d$ in the population; this determines the center of the Cohen's $d$ distribution. I suppose this is the noncentrality parameter.
lower.tail	logical; if TRUE (default), probabilities are the likelihood of finding a Cohen's $d$ smaller than the specified value; otherwise, the likelihood of finding a Cohen's $d$ larger than the specified value.
p	Vector of probabilities ( $p$ -values).
ds	A vector with two Cohen's $d$ values.
w	The desired maximum 'half-width' or margin of error of the confidence interval.
extensive	Whether to only return the required sample size, or more extensive results.

## Details

The functions use `convert.d.to.t()` and `convert.t.to.d()` to provide the Cohen's  $d$  distribution.

The confidence interval functions, `cohensdCI` and `pwr.cohensdCI`, now use the same method as MBESS (a slightly adapted version of the MBESS function `conf.limits.nct` is used).

More details about `cohensdCI` and `pwr.cohensdCI` are provided in Peters & Crutzen (2017).

## Value

`dCohensd` (or `dd`) gives the density, `pCohensd` (or `pd`) gives the distribution function, `qCohensd` (or `qd`) gives the quantile function, and `rCohensd` (or `rd`) generates random deviates.

`pdExtreme` returns the probability (or probabilities) of finding a Cohen's  $d$  equal to or more extreme than the specified value(s).

`pdMild` returns the probability (or probabilities) of finding a Cohen's  $d$  equal to or *less* extreme than the specified value(s).

`pdInterval` returns the probability of finding a Cohen's  $d$  that lies in between the two specified values of Cohen's  $d$ .

`cohensdCI` provides the confidence interval(s) for a given Cohen's  $d$  value.

`pwr.cohensdCI` provides the sample size required to obtain a confidence interval for Cohen's  $d$  with a desired width.

**Author(s)**

Gjalt-Jorn Peters (Open University of the Netherlands), with the exported MBESS function `conf.limits.nct` written by Ken Kelley (University of Notre Dame), and with an error noticed by Guy Prochilo (University of Melbourne).

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**References**

Peters, G. J. Y. & Crutzen, R. (2017) Knowing exactly how effective an intervention, treatment, or manipulation is and ensuring that a study replicates: accuracy in parameter estimation as a partial solution to the replication crisis. <https://dx.doi.org/>

Maxwell, S. E., Kelley, K., & Rausch, J. R. (2008). Sample size planning for statistical power and accuracy in parameter estimation. *Annual Review of Psychology*, *59*, 537-63. <https://doi.org/10.1146/annurev.psych.59.1030>

Cumming, G. (2013). The New Statistics: Why and How. *Psychological Science*, (November). <https://doi.org/10.1177/0956797613504966>

**See Also**

[convert.d.to.t\(\)](#), [convert.t.to.d\(\)](#), [dt\(\)](#), [pt\(\)](#), [qt\(\)](#), [rt\(\)](#)

**Examples**

```
### Confidence interval for Cohen's d of .5
### from a sample of 200 participants, also
### showing this visually: this clearly shows
### how wildly our Cohen's d value can vary
### from sample to sample.
cohensdCI(.5, n=200, plot=TRUE);

### How many participants would we need if we
### would want a more accurate estimate, say
### with a maximum confidence interval width
### of .2?
pwr.cohensdCI(.5, w=.1);

### Show that 'sampling distribution':
cohensdCI(.5,
          n=pwr.cohensdCI(.5, w=.1),
          plot=TRUE);

### Generate 10 random Cohen's d values
rCohensd(10, 20, populationD = .5);

### Probability of findings a Cohen's d smaller than
### .5 if it's 0 in the population (i.e. under the
### null hypothesis)
pCohensd(.5, 64);

### Probability of findings a Cohen's d larger than
```

```

### .5 if it's 0 in the population (i.e. under the
### null hypothesis)
1 - pCohensd(.5, 64);

### Probability of findings a Cohen's d more extreme
### than .5 if it's 0 in the population (i.e. under
### the null hypothesis)
pdExtreme(.5, 64);

### Probability of findings a Cohen's d more extreme
### than .5 if it's 0.2 in the population.
pdExtreme(.5, 64, populationD = .2);

```

---

computeStatistic\_t      *associationMatrix Helper Functions*

---

## Description

These objects contain a number of settings and functions for associationMatrix.

## Usage

```

computeStatistic_t(var1, var2, conf.level = 0.95, var.equal = TRUE, ...)
computeStatistic_r(var1, var2, conf.level = 0.95, ...)
computeStatistic_f(var1, var2, conf.level = 0.95, ...)
computeStatistic_chisq(var1, var2, conf.level = 0.95, ...)
computeEffectSize_d(var1, var2, conf.level = 0.95, var.equal = TRUE, ...)
computeEffectSize_r(var1, var2, conf.level = 0.95, ...)
computeEffectSize_etasq(var1, var2, conf.level = 0.95, ...)
computeEffectSize_omegasq(var1, var2, conf.level = 0.95, ...)

computeEffectSize_v(
  var1,
  var2,
  conf.level = 0.95,
  bootstrap = FALSE,
  samples = 5000,
  ...
)

```

**Arguments**

var1	One of the two variables for which to compute a statistic or effect size
var2	The other variable for which to compute the statistic or effect size
conf.level	The confidence for the confidence interval for the effect size
var.equal	Whether to test for equal variances (test), assume equality (yes), or assume inequality (no).
...	Any additional arguments are sometimes used to specify exactly how statistics and effect sizes should be computed.
bootstrap	Whether to bootstrap to estimate the confidence interval for Cramer's V. If FALSE, the Fisher's Z conversion is used.
samples	If bootstrapping, the number of samples to generate (of course, more samples means more accuracy and longer processing time).

**Value**

associationMatrixStatDefaults and associationMatrixESDefaults contain the default functions from computeStatistic and computeEffectSize that are called (see the help file for associationMatrix for more details).

The other functions return an object with the relevant statistic or effect size, with a confidence interval for the effect size.

For computeStatistic, this object always contains:

statistic	The relevant statistic
statistic.type	The type of statistic
parameter	The degrees of freedom for this statistic
p.raw	The p-value of this statistic for NHST

And in addition, it often contains (among other things, sometimes):

object	The object from which the statistics are extracted
--------	--

For computeEffectSize, this object always contains:

es	The point estimate for the effect size
esc.type	The type of effect size
ci	The confidence interval for the effect size

And in addition, it often contains (among other things, sometimes):

object	The object from which the effect size is extracted
--------	--

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**Examples**

```
computeStatistic_f(Orange$Tree, Orange$circumference)
computeEffectSize_etasq(Orange$Tree, Orange$circumference)
```

---

confintdjm	<i>Effect Size Confidence Interval: Cohens's d</i>
------------	--

---

**Description**

Effect Size Confidence Interval: Cohens's d

**Usage**

```
confintdjm(d = 0.5, n = 128, conf.level = 95)
```

**Arguments**

d	.
n	.
conf.level	.

**Value**

A results object containing:

results\$text	a html
results\$ciPlot	an image

---

confIntOmegaSq	<i>Confidence intervals for Omega Squared</i>
----------------	---

---

**Description**

This function uses the MBESS functions `conf.limits.ncf()` (which has been copied into this package to avoid the dependency on MBESS) and `convert.ncf.to.omegasq()` to compute the point estimate and confidence interval for Omega Squared (which have been lifted out of MBESS to avoid importing the whole package)

**Usage**

```
confIntOmegaSq(var1, var2, conf.level = 0.95)

## S3 method for class 'confIntOmegaSq'
print(x, ..., digits = 2)
```

**Arguments**

var1, var2	The two variables: one should be a factor (or will be made a factor), the other should have at least interval level of measurement. If none of the variables is a factor, the function will look for the variable with the least unique values and change it into a factor.
conf.level	Level of confidence for the confidence interval.
x, digits, ...	Respectively the object to print, the number of digits to round to, and any additional arguments to pass on to the print function.

**Value**

A confIntOmegaSq object is returned, with as elements:

input	The input arguments
intermediate	Objects generated while computing the output
output	The output of the function, consisting of:
output\$es	The point estimate
output\$ci	The confidence interval

**Note**

Formula 16 in Steiger (2004) is used for the conversion in `convert.ncf.to.omegasq()`.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**References**

Steiger, J. H. (2004). Beyond the F test: Effect size confidence intervals and tests of close fit in the analysis of variance and contrast analysis. *Psychological Methods*, 9(2), 164-82. <https://doi.org/10.1037/1082-989X.9.2.164>

**Examples**

```
confIntOmegaSq(mtcars$mpg, mtcars$cyl);
```

---

`confIntProp`*Confidence intervals for proportions, vectorized over all arguments*

---

## Description

This function simply computes confidence intervals for proportions.

## Usage

```
confIntProp(x, n, conf.level = 0.95, plot = FALSE)
```

## Arguments

<code>x</code>	The number of 'successes', i.e. the number of events, observations, or cases that one is interested in.
<code>n</code>	The total number of cases or observations.
<code>conf.level</code>	The confidence level.
<code>plot</code>	Whether to plot the confidence interval in the binomial distribution.

## Details

This function is the adapted source code of `binom.test()`. It uses `pbeta()`, with some lines of code taken from the `binom.test()` source. Specifically, the count for the low category is specified as first 'shape argument' to `pbeta()`, and the total count (either the sum of the count for the low category and the count for the high category, or the total number of cases if `compareHiToLo` is `FALSE`) minus the count for the low category as the second 'shape argument'.

## Value

The confidence interval bounds in a twodimensional matrix, with the first column containing the lower bound and the second column containing the upper bound.

## Author(s)

Unknown (see `binom.test()`; adapted by Gjalt-Jorn Peters)

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

## See Also

`binom.test()` and `ggProportionPlot`, the function for which this was written.



**Examples**

```
### Simple case
confIntProp(84, 200);

### Using vectors
confIntProp(c(2,3), c(10, 20), conf.level=c(.90, .95, .99));
```

---

 confIntR

*A function to compute a correlation's confidence interval*


---

**Description**

This function computes the confidence interval for a given correlation and its sample size. This is useful to obtain confidence intervals for correlations reported in papers when informing power analyses.

**Usage**

```
confIntR(r, N, conf.level = 0.95, plot = FALSE)
```

**Arguments**

r	The observed correlation coefficient.
N	The sample size of the sample where the correlation was computed.
conf.level	The desired confidence level of the confidence interval.
plot	Whether to show a plot.

**Value**

The confidence interval(s) in a matrix with two columns. The left column contains the lower bound, the right column the upper bound. The `rownames()` are the observed correlations, and the `colnames()` are 'lo' and 'hi'. The confidence level and sample size are stored as attributes. The results are returned like this to make it easy to access single correlation coefficients from the resulting object (see the examples).

**Author(s)**

Douglas Bonett (UC Santa Cruz, United States), with minor edits by Murray Moinester (Tel Aviv University, Israel) and Gjalt-Jorn Peters (Open University of the Netherlands, the Netherlands).

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

## References

Bonett, D. G., Wright, T. A. (2000). Sample size requirements for estimating Pearson, Kendall and Spearman correlations. *Psychometrika*, 65, 23-28.

Bonett, D. G. (2014). CIcorr.R and sizeCIcorr.R <https://people.ucsc.edu/~dgbonett/psyc181.html>

Moinester, M., & Gottfried, R. (2014). Sample size estimation for correlations with pre-specified confidence interval. *The Quantitative Methods of Psychology*, 10(2), 124-130. <https://www.tqmp.org/RegularArticles/vol10-2/p124/p124.pdf>

Peters, G. J. Y. & Crutzen, R. (forthcoming) An easy and foolproof method for establishing how effective an intervention or behavior change method is: required sample size for accurate parameter estimation in health psychology.

## See Also

[confIntR\(\)](#)

## Examples

```
### To request confidence intervals for one correlation
confIntR(.3, 100);

### The lower bound of a single correlation
confIntR(.3, 100)[1];

### To request confidence intervals for multiple correlations:
confIntR(c(.1, .3, .5), 250);

### The upper bound of the correlation of .5:
confIntR(c(.1, .3, .5), 250)['0.5', 'hi'];
```

---

confintrjmv

*Effect Size Confidence Interval: Pearson's r*

---

## Description

Effect Size Confidence Interval: Pearson's r

## Usage

```
confintrjmv(r = 0.3, N = 400, conf.level = 95)
```

**Arguments**

r .  
 N .  
 conf.level .

**Value**

A results object containing:

results\$text	a html
results\$ciPlot	an image

---

confIntSD	<i>Confidence interval for standard deviation</i>
-----------	---

---

**Description**

This function is vectorized.

**Usage**

```
confIntSD(x, n = NULL, conf.level = 0.95)
```

**Arguments**

x Either a standard deviation, in which case n must also be provided, or a vector, in which case n must be NULL.

n The sample size is x is a standard deviation.

conf.level The confidence level

**Value**

A vector or matrix.

**Examples**

```
ufs::confIntSD(mtcars$mpg);
ufs::confIntSD(c(6, 7), c(32, 32));
```

---

convert                      *conversion functions*

---

### Description

These are a number of functions to convert statistics and effect size measures from/to each other.

### Arguments

chisq, cohensf, cohensfsq, d, etasq, f, logodds, means, omegasq, or, p, r, t, z	The value of the relevant statistic or effect size.
ncf	The value of a noncentrality parameter of the F distribution.
n, n1, n2, N, ns	The number of observations that the r or t value is based on, or the number of observations in each of the two groups for an anova, or the total number of participants when specifying a noncentrality parameter.
df, df1, df2	The degrees of freedom for that statistic (for F, the first one is the numerator (i.e. the effect), and the second one the denominator (i.e. the error term)).
proportion	The proportion of participants in each of the two groups in a t-test or anova. This is used to compute the sample size in each group if the group sizes are unknown. Thus, if you only provide df1 and df2 when converting an F value to a Cohen's d value, equal group sizes are assumed.
b	The value of a regression coefficient.
se, sds	The standard error of standard errors of the relevant statistic (e.g. of a regression coefficient) or variables.
minDim	The smallest of the number of columns and the number of rows of the crosstable for which the chisquare is translated to a Cramer's V value.
lower.tail	For the F and chisquare distributions, whether to get the probability of the lower or upper tail.
akfEq8	When converting Cohen's <i>d</i> to <i>r</i> , for small sample sizes, bias is introduced when the commonly suggested formula is used (Aaron, Kromrey & Ferron, 1998). Therefore, by default, this function uses different equations depending on the sample size (for $n < 50$ and for $n > 50$ ). When akfEq8 is set to TRUE or FALSE, the corresponding action is taken; when akfEq8 is not logical (i.e. TRUE or FALSE), the function depends on the sample size.
var.equal	Whether to compute the value of <i>t</i> or Cohen's <i>d</i> assuming equal variances ('yes'), unequal variances ('no'), or whether to test for the difference ('test').

### Details

Note that by default, the behavior of `convert.d.to.r` depends on the sample size (see Bruce, Kromrey & Ferron, 1998).

### Value

The converted value as a numeric value.

**Author(s)**

Gjalt-Jorn Peters and Peter Verboon

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**References**

Aaron, B. Kromrey J. D. & Ferron, J. (1998) *Equating "r"-based and "d"-based Effect Size Indices: Problems with a Commonly Recommended Formula*. Paper presented at the Annual Meeting of the Florida Educational Research Association (43rd, Orlando, FL, November 2-4, 1998).

**Examples**

```
convert.t.to.r(t=-6.46, n=200);
convert.r.to.t(r=-.41, n=200);

### Compute some p-values
convert.t.to.p(4.2, 197);
convert.chisq.to.p(5.2, 3);
convert.f.to.p(8.93, 3, 644);

### Convert d to r using both equations
convert.d.to.r(d=.2, n1=5, n2=5, akfEq8 = FALSE);
convert.d.to.r(d=.2, n1=5, n2=5, akfEq8 = TRUE);
```

---

convert.cer.to.d      *Helper functions for Numbers Needed for Change*

---

**Description**

These functions are used by `behaviorchange::nnc()` to compute the Numbers Needed for Change, but are also available for manual use.

**Usage**

```
convert.cer.to.d(
  cer,
  eer,
  eventDesirable = TRUE,
  eventIfHigher = TRUE,
  dist = "norm",
  distArgs = NULL,
  distNS = "stats"
)

convert.d.to.eer(
  d,
```

```

    cer,
    eventDesirable = TRUE,
    eventIfHigher = TRUE,
    dist = "norm",
    distArgs = list(),
    distNS = "stats"
)

convert.d.to.nnc(d, cer, r = 1, eventDesirable = TRUE, eventIfHigher = TRUE)

convert.eer.to.d(
  eer,
  cer,
  eventDesirable = TRUE,
  eventIfHigher = TRUE,
  dist = "norm",
  distArgs = NULL,
  distNS = "stats"
)

```

### Arguments

cer	The Control Event Rate.
eer	The Experimental Event Rate.
eventDesirable	Whether an event is desirable or undesirable.
eventIfHigher	Whether scores above or below the threshold are considered 'an event'.
dist, distArgs, distNS	Used to specify the distribution to use to convert between Cohen's <i>d</i> and the CER and EER. <i>distArgs</i> can be used to specify additional arguments to the corresponding <i>q</i> and <i>p</i> functions, and <i>distNS</i> to specify the namespace (i.e. package) from where to get the distribution functions.
d	The value of Cohen's <i>d</i> .
r	The correlation between the determinant and behavior (for mediated Numbers Needed for Change).

### Value

The converted value.

### Author(s)

Gjalt-Jorn Peters & Stefan Gruijters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### References

Gruijters, S. L., & Peters, G. Y. (2019). Gauging the impact of behavior change interventions: A tutorial on the Numbers Needed to Treat. *PsyArXiv*. doi: [10.31234/osf.io/2bau7](https://doi.org/10.31234/osf.io/2bau7)

**See Also**

[behaviorchange::nnc\(\)](#)

**Examples**

```
convert.d.to.eer(d=.5, cer=.25);
convert.d.to.nnc(d=.5, cer=.25);
```

---

convert.d.to.U3	<i>Convert Cohen's d to U3</i>
-----------------	--------------------------------

---

**Description**

This function simply returns the result of [pnorm\(\)](#) for Cohen's d.

**Usage**

```
convert.d.to.U3(d)
```

**Arguments**

d                   Cohen's d.

**Value**

An unnames numeric vector with the U3 values.

**Examples**

```
convert.d.to.U3(.5);
```

---

convertToNumeric	<i>Conveniently convert vectors to numeric</i>
------------------	--

---

**Description**

Tries to 'smartly' convert factor and character vectors to numeric.

**Usage**

```
convertToNumeric(vector, byFactorLabel = FALSE)
```

**Arguments**

vector	The vector to convert.
byFactorLabel	When converting factors, whether to do this by their label value (TRUE) or their level value (FALSE).

**Value**

The converted vector.

**Examples**

```
ufs::convertToNumeric(as.character(1:8));
```

---

cramersV	<i>Cramer's V and its confidence interval</i>
----------	---

---

**Description**

These functions compute the point estimate and confidence interval for Cramer's V.

**Usage**

```
cramersV(x, y = NULL, digits = 2)

## S3 method for class 'CramersV'
print(x, digits = x$input$digits, ...)

confIntV(
  x,
  y = NULL,
  conf.level = 0.95,
  samples = 500,
  digits = 2,
  method = c("bootstrap", "fisher"),
  storeBootstrappingData = FALSE
)

## S3 method for class 'confIntV'
print(x, digits = x$input$digits, ...)
```

**Arguments**

x	Either a crosstable to analyse, or one of two vectors to use to generate that crosstable. The vector should be a factor, i.e. a categorical variable identified as such by the 'factor' class).
y	If x is a crosstable, y can (and should) be empty. If x is a vector, y must also be a vector.



digits	Minimum number of digits after the decimal point to show in the result.
...	Any additional arguments are passed on to the print function.
conf.level	Level of confidence for the confidence interval.
samples	Number of samples to generate when bootstrapping.
method	Whether to use Fisher's Z or bootstrapping to compute the confidence interval.
storeBootstrappingData	Whether to store (or discard) the data generating during the bootstrapping procedure.

**Value**

A point estimate or a confidence interval for Cramer's  $V$ , an effect size to describe the association between two categorical variables.

**Examples**

```
### Get confidence interval for Cramer's V
### Note that by using 'table', and so removing the raw data, inhibits
### bootstrapping, which could otherwise take a while.
confIntV(table(infert$education, infert$induced));
```

---

dataShape                      *normalityAssessment and samplingDistribution*

---

**Description**

normalityAssessment can be used to assess whether a variable and the sampling distribution of its mean have an approximately normal distribution.

**Usage**

```
dataShape(
  sampleVector,
  na.rm = TRUE,
  type = 2,
  digits = 2,
  conf.level = 0.95,
  plots = TRUE,
  xLabs = NA,
  yLabs = NA,
  qqCI = TRUE,
  labelOutliers = TRUE,
  sampleSizeOverride = NULL
)
```

```

## S3 method for class 'dataShape'
print(x, digits = x$input$digits, extraNotification = TRUE, ...)

## S3 method for class 'dataShape'
pander(x, digits = x$input$digits, extraNotification = TRUE, ...)

normalityAssessment(
  sampleVector,
  samples = 10000,
  digits = 2,
  samplingDistColor = "#2222CC",
  normalColor = "#00CC00",
  samplingDistLineSize = 2,
  normalLineSize = 1,
  xLabel.sampleDist = NULL,
  yLabel.sampleDist = NULL,
  xLabel.samplingDist = NULL,
  yLabel.samplingDist = NULL,
  sampleSizeOverride = TRUE
)

## S3 method for class 'normalityAssessment'
print(x, ...)

## S3 method for class 'normalityAssessment'
pander(x, headerPrefix = "####", suppressPlot = FALSE, ...)

samplingDistribution(
  popValues = c(0, 1),
  popFrequencies = c(50, 50),
  sampleSize = NULL,
  sampleFromPop = FALSE,
  ...
)

```

### Arguments

sampleVector	Numeric vector containing the sample data.
na.rm	Whether to remove missing data first.
type	Type of skewness and kurtosis to compute; either 1 (g1 and g2), 2 (G1 and G2), or 3 (b1 and b2). See Joanes & Gill (1998) for more information.
digits	Number of digits to use when printing results.
conf.level	Confidence of confidence intervals.
plots	Whether to display plots.
xLabs, yLabs	The axis labels for the three plots (should be vectors of three elements; the first specifies the X or Y axis label for the rightmost plot (the histogram), the second for the middle plot (the QQ plot), and the third for the rightmost plot (the box plot).

qqCI	Whether to show the confidence interval for the QQ plot.
labelOutliers	Whether to label outliers with their row number in the box plot.
sampleSizeOverride	Whether to use the sample size of the sample as sample size for the sampling distribution, instead of the sampling distribution size. This makes sense, because otherwise, the sample size and thus sensitivity of the null hypothesis significance tests is a function of the number of samples used to generate the sampling distribution.
x	The object to print/pander.
extraNotification	Whether to be particularly informative.
...	Additional arguments are passed on, usually to the default methods.
samples	Number of samples to use when constructing sampling distribution.
samplingDistColor	Color to use when drawing the sampling distribution.
normalColor	Color to use when drawing the standard normal curve.
samplingDistLineSize	Size of the line used to draw the sampling distribution.
normalLineSize	Size of the line used to draw the standard normal distribution.
xLabel.sampleDist	Label of x axis of the distribution of the sample.
yLabel.sampleDist	Label of y axis of the distribution of the sample.
xLabel.samplingDist	Label of x axis of the sampling distribution.
yLabel.samplingDist	Label of y axis of the sampling distribution.
headerPrefix	A prefix to insert before the heading (e.g. to use Markdown headings).
suppressPlot	Whether to suppress (TRUE) or print (FALSE) the plot.
popValues	The possible values (levels) of the relevant variable. For example, for a dichotomous variable, this can be "c(1:2)" (or "c(1, 2)"). Note that samplingDistribution is for manually specifying the frequency distribution (or proportions); if you have a vector with 'raw' data, just call normalityAssessment directly.
popFrequencies	The frequencies corresponding to each value in popValues; must be in the same order! See the examples.
sampleSize	Size of the sample; the sum of the frequencies if not specified.
sampleFromPop	If true, the sample vector is created by sampling from the population information specified; if false, rep() is used to generate the sample vector. Note that if proportions are supplied in popFrequencies, sampling from the population is necessary!

## Details

samplingDistribution is a convenient wrapper for normalityAssessment that makes it easy to quickly generate a sample and sampling distribution from frequencies (or proportions).

dataShape computes the skewness and kurtosis.

normalityAssessment provides a number of normality tests and draws histograms of the sample data and the sampling distribution of the mean (most statistical tests assume the latter is normal, rather than the first; normality of the sample data guarantees normality of the sampling distribution of the mean, but if the sample size is sufficiently large, the sampling distribution of the mean is approximately normal even when the sample data are not normally distributed). Note that for the sampling distribution, the degrees of freedom are usually so huge that the normality tests, negligible deviations from normality will already result in very small p-values.

samplingDistribution makes it easy to quickly assess the distribution of a variables based on frequencies or proportions, and dataShape computes skewness and kurtosis.

## Value

An object with several results, the most notably of which are:

plot.sampleDist	Histogram of sample distribution
sw.sampleDist	Shapiro-Wilk normality test of sample distribution
ad.sampleDist	Anderson-Darling normality test of sample distribution
ks.sampleDist	Kolmogorov-Smirnof normality test of sample distribution
kurtosis.sampleDist	Kurtosis for sample distribution
skewness.sampleDist	Skewness for sample distribution
plot.samplingDist	Histogram of sampling distribution
sw.samplingDist	Shapiro-Wilk normality test of sampling distribution
ad.samplingDist	Anderson-Darling normality test of sampling distribution
ks.samplingDist	Kolmogorov-Smirnof normality test of sampling distribution
dataShape.samplingDist	Skewness and kurtosis for sampling distribution

## Examples

```
### Note: the 'not run' is simply because running takes a lot of time,
###       but these examples are all safe to run!
## Not run:

normalityAssessment(rnorm(35));
```

```

### Create a distribution of three possible values and
### show the sampling distribution for the mean
popValues <- c(1, 2, 3);
popFrequencies <- c(20, 50, 30);
sampleSize <- 100;
samplingDistribution(popValues = popValues,
                    popFrequencies = popFrequencies,
                    sampleSize = sampleSize);

### Create a very skewed distribution of ten possible values
popValues <- c(1, 2, 3, 4, 5, 6, 7, 8, 9, 10);
popFrequencies <- c(2, 4, 8, 6, 10, 15, 12, 200, 350, 400);
samplingDistribution(popValues = popValues,
                    popFrequencies = popFrequencies,
                    sampleSize = sampleSize, digits=5);

## End(Not run)

```

---

 descr

*descr (or descriptives)*


---

## Description

This function provides a number of descriptives about your data, similar to what SPSS's DESCRIPTIVES (often called with DESCR) does.

## Usage

```

descr(
  x,
  digits = 4,
  errorOnFactor = FALSE,
  include = c("central tendency", "spread", "range", "distribution shape",
             "sample size"),
  maxModes = 1,
  t = FALSE,
  conf.level = 0.95,
  quantileType = 2
)

```

## Default S3 method:

```

descr(
  x,
  digits = 4,
  errorOnFactor = FALSE,
  include = c("central tendency", "spread", "range", "distribution shape",

```

```

    "sample size"),
  maxModes = 1,
  t = FALSE,
  conf.level = 0.95,
  quantileType = 2
)

## S3 method for class 'descr'
print(
  x,
  digits = attr(x, "digits"),
  t = attr(x, "transpose"),
  row.names = FALSE,
  ...
)

## S3 method for class 'descr'
pander(x, headerPrefix = "", headerStyle = "**", ...)

## S3 method for class 'descr'
as.data.frame(x, row.names = NULL, optional = FALSE, ...)

## S3 method for class 'data.frame'
descr(x, ...)

```

## Arguments

<code>x</code>	The vector for which to return descriptives.
<code>digits</code>	The number of digits to round the results to when showing them.
<code>errorOnFactor</code>	Whether to show an error when the vector is a factor, or just show the frequencies instead.
<code>include</code>	Which elements to include when showing the results.
<code>maxModes</code>	Maximum number of modes to display: displays "multi" if more than this number of modes if found.
<code>t</code>	Whether to transpose the dataframes when printing them to the screen (this is easier for users relying on screen readers).
<code>conf.level</code>	Confidence of confidence interval around the mean in the central tendency measures.
<code>quantileType</code>	The type of quantiles to be used to compute the interquartile range (IQR). See <a href="#">quantile</a> for more information.
<code>row.names</code>	Whether to show row names (TRUE) or not (FALSE).
<code>...</code>	Additional arguments are passed to the default <code>print</code> and <code>pander</code> methods.
<code>headerPrefix</code>	The prefix for the heading; can be used to insert hashes (#) to create Markdown headings.
<code>headerStyle</code>	A string to insert before and after the heading (to make stuff bold or italic in Markdown).

optional      Provided for compatibility with the default `as.data.frame()` method - see that help page for details.

### Details

Note that R (of course) has many similar functions, such as `summary`, `psych::describe()` in the excellent `psych::psych` package.

The Hartigans' Dip Test may be unfamiliar to users; it is a measure of uni- vs. multidimensionality, computed by `diptest::dip.test()` from the `dip.test` package. Depending on the sample size, values over .025 can be seen as mildly indicative of multimodality, while values over .05 probably warrant closer inspection (the p-value can be obtained using `diptest::dip.test()`; also see Table 1 of Hartigan & Hartigan (1985) for an indication as to critical values).

### Value

A list of dataframes with the requested values.

### Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### References

Hartigan, J. A.; Hartigan, P. M. The Dip Test of Unimodality. *Ann. Statist.* 13 (1985), no. 1, 70–84. doi:10.1214/aos/1176346577. <https://projecteuclid.org/euclid.aos/1176346577>.

### See Also

`summary`, `psych::describe()`

### Examples

```
descr(mtcars$mpg);
```

---

diamondCoordinates      *Basic ggplot2 diamond plot layer construction functions*

---

### Description

These functions are used by `diamondPlot()` to construct a diamond plot. It's normally not necessary to call this function directly: instead, use `meansDiamondPlot()`, `meanSDtoDiamondPlot()`, and `factorLoadingDiamondCIplot()`.

**Usage**

```

diamondCoordinates(
  values,
  otherAxisValue = 1,
  direction = "horizontal",
  autoSize = NULL,
  fixedSize = 0.15
)

ggDiamondLayer(
  data,
  ciCols = 1:3,
  colorCol = NULL,
  generateColors = NULL,
  fullColorRange = NULL,
  color = "black",
  lineColor = NA,
  otherAxisCol = 1:nrow(data),
  autoSize = NULL,
  fixedSize = 0.15,
  direction = "horizontal",
  ...
)

rawDataDiamondLayer(
  dat,
  items = NULL,
  itemOrder = 1:length(items),
  dataAlpha = 0.1,
  dataColor = "#444444",
  jitterWidth = 0.5,
  jitterHeight = 0.4,
  size = 3,
  ...
)

varsToDiamondPlotDf(
  dat,
  items = NULL,
  labels = NULL,
  decreasing = NULL,
  conf.level = 0.95
)

```

**Arguments**

**values** A vector of 2 or more values that are used to construct the diamond coordinates. If three values are provided, the middle one becomes the diamond's center. If



	two, four, or more values are provided, the median becomes the diamond's center.
otherAxisValue	The value on the other axis to use to compute the coordinates; this will be the Y axis value of the points of the diamond (if direction is 'horizontal') or the X axis value (if direction is 'vertical').
direction	Whether the diamonds should be constructed horizontally or vertically.
autoSize	Whether to make the height of each diamond conditional upon its length (the width of the confidence interval).
fixedSize	If not using relative heights, fixedSize determines the height to use.
data, dat	A dataframe (or matrix) containing lower bounds, centers (e.g. means), and upper bounds of intervals (e.g. confidence intervals) for ggDiamondLayer or items and raw data for varsToDiamondPlotDf and rawDataDiamondLayer.
ciCols	The columns in the dataframe with the lower bounds, centers (e.g. means), and upper bounds (in that order).
colorCol	The column in the dataframe containing the colors for each diamond, or a vector with colors (with as many elements as the dataframe has rows).
generateColors	A vector with colors to use to generate a gradient. These colors must be valid arguments to <code>colorRamp()</code> (and therefore, to <code>col2rgb()</code> ).
fullColorRange	When specifying a gradient using generateColors, it is usually desirable to specify the minimum and maximum possible value corresponding to the outer anchors of that gradient. For example, when plotting numbers from 0 to 100 using a gradient from 'red' through 'orange' to 'green', none of the means may actually be 0 or 100; the lowest mean may be, for example, 50. If no fullColorRange is specified, the diamond representing that lowest mean of 50 will be red, not orange. When specifying the fullColorRange, the lowest and highest 'colors' in generateColors are anchored to the minimum and maximum values of fullColorRange.
color	When no colors are automatically generated, all diamonds will have this color.
lineColor	If NA, lines will have the same colors as the diamonds' fill. If not NA, must be a valid color, which is then used as line color. Note that e.g. linetype and color can be used as well, which will be passed on to <code>geom_polygon()</code> .
otherAxisCol	A vector of values, or the index of the column in the dataframe, that specifies the values for the Y axis of the diamonds. This should normally just be a vector of consecutive integers.
...	Any additional arguments are passed to <code>geom_polygon()</code> . This can be used to set, for example, the alpha value of the diamonds. Additional arguments for rawDataDiamondLayer are passed on to <code>geom_jitter()</code> .
items	The items from the dataframe to include in the diamondplot or dataframe.
itemOrder	Order of the items to use (if not sorting).
dataAlpha	This determines the alpha (transparency) of the data points.
dataColor	The color of the data points.
jitterWidth	How much to jitter the individual datapoints horizontally.
jitterHeight	How much to jitter the individual datapoints vertically.

size	The size of the data points.
labels	The item labels to add to the dataframe.
decreasing	Whether to sort the items (rows) in the dataframe decreasing (TRUE), increasing (FALSE), or not at all (NULL).
conf.level	The confidence of the confidence intervals.

## Value

ggDiamondLayer returns a `ggplot()` `geom_polygon()` object, which can then be used in `ggplot()` plots (as `diamondPlot()` does).

diamondCoordinates returns a set of four coordinates that together specify a diamond.

varsToDiamondPlotDf returns a dataframe of diamondCoordinates.

rawDataDiamondLayer returns a `geom_jitter()` object.

## Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

## See Also

[meansDiamondPlot\(\)](#), [meanSDtoDiamondPlot\(\)](#), [factorLoadingDiamondCIplot\(\)](#), [diamondPlot\(\)](#)

## Examples

```
## Not run:
### (Don't run this example as a test, because we
### need the ggplot function which isn't part of
### this package.)

### The coordinates for a simple diamond
diamondCoordinates(values = c(1,2,3));

### Plot this diamond
ggplot() + ggDiamondLayer(data.frame(1,2,3));

## End(Not run)
```

diamondPlot

*Basic diamond plot construction function***Description**

This function constructs a diamond plot using `ggDiamondLayer()`. It's normally not necessary to call this function directly: instead, use `meansDiamondPlot()`, `meanSDtoDiamondPlot()`, and `factorLoadingDiamondCIplot()`.

**Usage**

```
diamondPlot(
  data,
  ciCols = 1:3,
  colorCol = NULL,
  otherAxisCol = NULL,
  yValues = NULL,
  yLabels = NULL,
  ylab = NULL,
  autoSize = NULL,
  fixedSize = 0.15,
  xlab = "Effect Size Estimate",
  theme = ggplot2::theme_bw(),
  color = "black",
  returnLayerOnly = FALSE,
  outputFile = NULL,
  outputWidth = 10,
  outputHeight = 10,
  ggsaveParams = ufs::opts$get("ggsaveParams"),
  ...
)
```

**Arguments**

<code>data</code>	A dataframe (or matrix) containing lower bounds, centers (e.g. means), and upper bounds of intervals (e.g. confidence intervals).
<code>ciCols</code>	The columns in the dataframe with the lower bounds, centers (e.g. means), and upper bounds (in that order).
<code>colorCol</code>	The column in the dataframe containing the colors for each diamond, or a vector with colors (with as many elements as the dataframe has rows).
<code>otherAxisCol</code>	The column in the dataframe containing the values that determine where on the Y axis the diamond should be placed. If this is not available in the dataframe, specify it manually using <code>yValues</code> .
<code>yValues</code>	The values that determine where on the Y axis the diamond should be placed (can also be a column in the dataframe; in that case, use <code>otherAxisCol</code> ).

yLabels	The labels to use for for each diamond (placed on the Y axis).
autoSize	Whether to make the height of each diamond conditional upon its length (the width of the confidence interval).
fixedSize	If not using relative heights, fixedSize determines the height to use.
xlab, ylab	The labels of the X and Y axes.
theme	The theme to use.
color	Color to use if colors are specified for each diamond.
returnLayerOnly	Set this to TRUE to only return the <code>ggplot()</code> layer of the diamondplot, which can be useful to include it in other plots.
outputFile	A file to which to save the plot.
outputWidth, outputHeight	Width and height of saved plot (specified in centimeters by default, see <code>ggsaveParams</code> ).
ggsaveParams	Parameters to pass to <code>ggsave</code> when saving the plot.
...	Additional arguments will be passed to <code>ggDiamondLayer()</code> .

**Value**

A `ggplot2::ggplot()` plot with a `ggDiamondLayer()` is returned.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

[meansDiamondPlot\(\)](#), [meanSDtoDiamondPlot\(\)](#), [ggDiamondLayer\(\)](#), [factorLoadingDiamondCIplot\(\)](#)

**Examples**

```
tmpDf <- data.frame(lo = c(1, 2, 3),
                   mean = c(1.5, 3, 5),
                   hi = c(2, 4, 10),
                   color = c('green', 'red', 'blue'));

### A simple diamond plot
diamondPlot(tmpDf);

### A diamond plot using the specified colours
diamondPlot(tmpDf, colorCol = 4);

### A diamond plot using automatically generated colours
### using a gradient
diamondPlot(tmpDf, generateColors=c('green', 'red'));

### A diamond plot using automatically generated colours
```

```
### using a gradient, specifying the minimum and maximum
### possible values that can be attained
diamondPlot(tmpDf, generateColors=c('green', 'red'),
            fullColorRange=c(1, 10));
```

---

disattenuate.d	<i>Disattenuate a Cohen's d estimate for unreliability in the continuous variable</i>
----------------	---

---

### Description

Measurement error (i.e. the complement of reliability) results in a downward bias of observed effect sizes. This attenuation can be reversed by disattenuation.

### Usage

```
disattenuate.d(d, reliability)
```

### Arguments

d	The (attenuated) value of Cohen's d (i.e. the value as observed in the sample, and therefore attenuated (decreased) by measurement error in the continuous variable).
reliability	The reliability of the measurements of the continuous variable

### Value

The disattenuated value of Cohen's d

### Author(s)

Gjalt-Jorn Peters & Stefan Gruijters

### References

Bobko, P., Roth, P. L., & Bobko, C. (2001). Correcting the Effect Size of d for Range Restriction and Unreliability. *Organizational Research Methods*, 4(1), 46–61. doi: [10.1177/109442810141003](https://doi.org/10.1177/109442810141003)

### Examples

```
disattenuate.d(.5, .8);
```

---

disattenuate.r                      *Disattenuate a Pearson's r estimate for unreliability*

---

**Description**

Disattenuate a Pearson's r estimate for unreliability

**Usage**

```
disattenuate.r(r, reliability1, reliability2)
```

**Arguments**

r                                      The (attenuated) value of Pearson's r  
reliability1, reliability2            The reliabilities of the two variables

**Value**

The disattenuated value of Pearson's r

**Examples**

```
disattenuate.r(.5, .8, .9);
```

---

duoComparisonDiamondPlot

*meansComparisonDiamondPlot and duoComparisonDiamondPlot*

---

**Description**

These are two diamond plot functions to conveniently make diamond plots to compare subgroups or different samples. They are both based on a univariate diamond plot where colors are used to distinguish the data points and diamonds of each subgroup or sample. The means comparison diamond plot produces only this plot, while the duo comparison diamond plot combines it with a diamond plot visualising the effect sizes of the associations. The latter currently only works for two subgroups or samples, while the simple meansComparisonDiamondPlot also works when comparing more than two sets of datapoints. These functions are explained more in detail in Peters (2017).

**Usage**

```
duoComparisonDiamondPlot(  
  dat,  
  items = NULL,  
  compareBy = NULL,  
  labels = NULL,  
  compareByLabels = NULL,  
  decreasing = NULL,  
  conf.level = c(0.95, 0.95),  
  showData = TRUE,  
  dataAlpha = 0.1,  
  dataSize = 3,  
  comparisonColors = viridis::viridis(length(unique(dat[, compareBy]))),  
  associationsColor = "grey",  
  alpha = 0.33,  
  jitterWidth = 0.5,  
  jitterHeight = 0.4,  
  xlab = c("Scores and means", "Effect size estimates"),  
  ylab = c(NULL, NULL),  
  plotTitle = NULL,  
  theme = ggplot2::theme_bw(),  
  showLegend = TRUE,  
  legend.position = "top",  
  lineSize = 1,  
  drawPlot = TRUE,  
  xbreaks = "auto",  
  outputFile = NULL,  
  outputWidth = 10,  
  outputHeight = 10,  
  ggsaveParams = ufs::opts$get("ggsaveParams"),  
  ...  
)  
  
meansComparisonDiamondPlot(  
  dat,  
  items = NULL,  
  compareBy = NULL,  
  labels = NULL,  
  compareByLabels = NULL,  
  decreasing = NULL,  
  sortBy = NULL,  
  conf.level = 0.95,  
  showData = TRUE,  
  dataAlpha = 0.1,  
  dataSize = 3,  
  comparisonColors = viridis::viridis(length(unique(dat[, compareBy]))),  
  alpha = 0.33,  
  jitterWidth = 0.5,
```

```

    jitterHeight = 0.4,
    xlab = "Scores and means",
    ylab = NULL,
    plotTitle = NULL,
    theme = ggplot2::theme_bw(),
    showLegend = TRUE,
    legend.position = "top",
    lineSize = 1,
    xbreaks = "auto",
    outputFile = NULL,
    outputWidth = 10,
    outputHeight = 10,
    ggsaveParams = ufs::opts$get("ggsaveParams"),
    ...
  )

```

### Arguments

<code>dat</code>	The dataframe containing the relevant variables.
<code>items</code>	The variables to plot (on the y axis).
<code>compareBy</code>	The variable by which to compare (i.e. the variable indicating to which subgroup or sample a row in the dataframe belongs).
<code>labels</code>	The labels to use on the y axis; these values will replace the variable names in the dataframe (specified in <code>items</code> ).
<code>compareByLabels</code>	The labels to use to replace the value labels of the <code>compareBy</code> variable.
<code>decreasing</code>	Whether to sort the variables by their mean values (NULL to not sort, TRUE to sort in descending order (i.e. items with lower means are plotted more to the bottom), and FALSE to sort in ascending order (i.e. items with lower means are plotted more to the top).
<code>conf.level</code>	The confidence level of the confidence intervals specified by the diamonds for the means (for <code>meansComparisonDiamondPlot</code> ) and for both the means and effect sizes (for <code>duoComparisonDiamondPlot</code> ).
<code>showData</code>	Whether to plot the data points.
<code>dataAlpha</code>	The transparency (alpha channel) value for the data points: a value between 0 and 1, where 0 denotes complete transparency and 1 denotes complete opacity.
<code>dataSize</code>	The size of the data points.
<code>comparisonColors</code>	The colors to use for the different subgroups or samples. This should be a vector of valid colors with at least as many elements as sets of data points that should be plotted.
<code>associationsColor</code>	For <code>duoComparisonDiamondPlot</code> , the color to use to plot the effect sizes in the right-hand plot.
<code>alpha</code>	The alpha channel (transparency) value for the diamonds: a value between 0 and 1, where 0 denotes complete transparency and 1 denotes complete opacity.



jitterWidth, jitterHeight	How much noise to add to the data points (to prevent overplotting) in the horizontal (x axis) and vertical (y axis) directions.
xlab, ylab	The label to use for the x and y axes (for duoComparisonDiamondPlot, must be vectors of two elements). Use NULL to not use a label.
plotTitle	Optionally, for meansComparisonDiamondPlot, a title for the plot (can also be specified for duoComparisonDiamondPlot, in which case it's passed on to meansComparisonDiamondPlot for the left panel - but note that this messes up the alignment of the two panels).
theme	The theme to use for the plots.
showLegend	Whether to show the legend (which color represents which subgroup/sample).
legend.position	Where to place the legend in meansComparisonDiamondPlot (can also be specified for duoComparisonDiamondPlot, in which case it's passed on to meansComparisonDiamondPlot for the left panel - but note that this messes up the alignment of the two panels).
lineSize	The thickness of the lines (the diamonds' strokes).
drawPlot	Whether to draw the plot, or only (invisibly) return it.
xbreaks	Where the breaks (major grid lines, ticks, and labels) on the x axis should be.
outputFile	A file to which to save the plot.
outputWidth, outputHeight	Width and height of saved plot (specified in centimeters by default, see ggsaveParams).
ggsaveParams	Parameters to pass to ggsave when saving the plot.
...	Any additional arguments are passed to <code>diamondPlot()</code> by meansComparisonDiamondPlot and to both meansComparisonDiamondPlot and <code>associationsDiamondPlot()</code> by duoComparisonDiamondPlot.
sortBy	If the variables should be sorted (see <code>decreasing</code> ), this variable specified which subgroup should be sorted by. Therefore, the value specified here must be a value label ('level label') of the compareBy variable.

## Details

These functions are explained in Peters (2017).

## Value

A Diamond plots: a `ggplot2::ggplot()` plot meansComparisonDiamondPlot, and a `gtable()` by duoComparisonDiamondPlot.

## Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

## References

Peters, G.-J. Y. (2017). Diamond Plots: a tutorial to introduce a visualisation tool that facilitates interpretation and comparison of multiple sample estimates while respecting their inaccuracy. *PsyArXiv*. <http://doi.org/10.17605/OSF.IO/9W8YV>

## See Also

[diamondPlot\(\)](#), [meansDiamondPlot\(\)](#), [behaviorchange::CIBER\(\)](#)

## Examples

```
meansComparisonDiamondPlot(mtcars,
  items=c('disp', 'hp'),
  compareBy='vs',
  xbreaks=c(100,200, 300, 400));
meansComparisonDiamondPlot(chickwts,
  items='weight',
  compareBy='feed',
  xbreaks=c(100,200,300,400),
  showData=FALSE);
duoComparisonDiamondPlot(mtcars,
  items=c('disp', 'hp'),
  compareBy='vs',
  xbreaks=c(100,200, 300, 400));
```

---

escapeRegex

*Escapes any characters that would have special meaning in a regular expression.*

---

## Description

Escapes any characters that would have special meaning in a regular expression.

## Usage

```
escapeRegex(string)
```

## Arguments

string            string being operated on.

## Details

escapeRegex will escape any characters that would have special meaning in a regular expression. For any string `grep(regexEscape(string), string)` will always be true.

**Value**

The value of the string with any characters that would have special meaning in a regular expression escaped.

**Note**

Note that this function was copied literally from the Hmisc package (to prevent importing the entire package for one line of code).

**Author(s)**

Charles Dupont  
Department of Biostatistics  
Vanderbilt University

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

[grep](#), [Hmisc](#), <https://hbiostat.org/R/Hmisc/>, <https://github.com/harrelfe/Hmisc>

**Examples**

```
string <- "this\\(system) {is} [full]."  
escapeRegex(string)
```

---

exportToHTML

*Exporting tables to HTML*

---

**Description**

This function exports data frames or matrices to HTML, sending output to one or more of the console, viewer, and one or more files.

**Usage**

```
exportToHTML(  
  input,  
  output = ufs::opts$get("tableOutput"),  
  tableOutputCSS = ufs::opts$get("tableOutputCSS")  
)
```

**Arguments**

input	Either a <code>data.frame</code> , <code>table</code> , or <code>matrix</code> , or a list with three elements: <code>pre</code> , <code>input</code> , and <code>post</code> . The <code>pre</code> and <code>post</code> are simply prepended and postpended to the HTML generated based on the <code>input\$input</code> element.
output	The output: a character vector with one or more of "console" (the raw concatenated input, without conversion to HTML), "viewer", which uses the RStudio viewer if available, and one or more filenames in existing directories.
tableOutputCSS	The CSS to use for the HTML table.

**Value**

Invisibly, the (potentially concatenated) input as character vector.

**Examples**

```
exportToHTML(mtcars[1:5, 1:5]);
```

---

extractVarName	<i>Extract variable names</i>
----------------	-------------------------------

---

**Description**

Functions often get passed variables from within dataframes or other lists. However, printing these names with all their dollar signs isn't very userfriendly. This function simply uses a regular expression to extract the actual name.

**Usage**

```
extractVarName(x)
```

**Arguments**

x                    A character vector of one or more variable names.

**Value**

The actual variables name, with all containing objectes stripped off.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**Examples**

```
extractVarName('mtcars$mpg');
```

---

`faConfInt`*Extract confidence bounds from psych's factor analysis object*

---

### Description

This function contains some code from a function in [psych::psych-package](#) that's not exported `print.psych.fa.ci` but useful nonetheless. It basically takes the outcomes of a factor analysis and extracted the confidence intervals.

### Usage

```
faConfInt(fa)
```

### Arguments

`fa` The object produced by the `psych::fa()` function from the [psych::psych-package](#) package. It is important that the `n.iter` argument of `psych::fa()` was set to a realistic number, because otherwise, no confidence intervals will be available.

### Details

This function extract confidence interval bounds and combines them with factor loadings using the code from the `print.psych.fa.ci` in [psych::psych-package](#).

### Value

A list of dataframes, one for each extracted factor, with in each dataframe three variables:

<code>lo</code>	lower bound of the confidence interval
<code>est</code>	point estimate of the factor loading
<code>hi</code>	upper bound of the confidence interval

### Author(s)

William Revelle (extracted by Gjalt-Jorn Peters)

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### Examples

```
## Not run:
### Not run because it takes too long to run to test it,
### and may produce warnings, both because of the bootstrapping
### required to generate the confidence intervals in fa
faConfInt(psych::fa(Thurstone.33, 2, n.iter=100, n.obs=100));

## End(Not run)
```

---

 factorLoadingDiamondCIplot

*Two-dimensional visualisation of factor analyses*


---

## Description

This function uses the `diamondPlot()` to visualise the results of a factor analyses. Because the factor loadings computed in factor analysis are point estimates, they may vary from sample to sample. The factor loadings for any given sample are usually not relevant; samples are but means to study populations, and so, researchers are usually interested in population values for the factor loadings. However, tables with lots of loadings can quickly become confusing and intimidating. This function aims to facilitate working with and interpreting factor analysis based on confidence intervals by visualising the factor loadings and their confidence intervals.

## Usage

```
factorLoadingDiamondCIplot(
  fa,
  xlab = "Factor Loading",
  colors = (viridis::viridis_pal())(max(2, fa$factors)),
  labels = NULL,
  theme = ggplot2::theme_bw(),
  sortAlphabetically = FALSE,
  ...
)
```

## Arguments

<code>fa</code>	The object produced by the <code>psych::fa()</code> function from the <code>psych::psych</code> package. It is important that the <code>n.iter</code> argument of <code>psych::fa()</code> was set to a realistic number, because otherwise, no confidence intervals will be available.
<code>xlab</code>	The label for the x axis.
<code>colors</code>	The colors used for the factors. The default uses the discrete <code>viridis()</code> palette, which is optimized for perceptual uniformity, maintaining its properties when printed in grayscale, and designed for colourblind readers. A vector can also be supplied; the colors must be valid arguments to <code>colorRamp()</code> (and therefore, to <code>col2rgb()</code> ).
<code>labels</code>	The labels to use for the items (on the Y axis).
<code>theme</code>	The ggplot2 theme to use.
<code>sortAlphabetically</code>	Whether to sort the items alphabetically.
<code>...</code>	Additional arguments will be passed to <code>ggDiamondLayer()</code> . This can be used to set, for example, the transparency (alpha value) of the diamonds to a lower value using e.g. <code>alpha=.5</code> .

**Value**

A `ggplot2::ggplot()` plot with several `ggDiamondLayer()`s is returned.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

`psych::fa()`, `ss`, `meansDiamondPlot()`, `meanSDtoDiamondPlot()`, `diamondPlot()`, `ggDiamondLayer()`

**Examples**

```
## Not run:
### (Not run during testing because it takes too long and
### may generate warnings because of the bootstrapping of
### the confidence intervals)

factorLoadingDiamondCIplot(psych::fa(psych::Bechtoldt,
                                     nfactors=2,
                                     n.iter=50,
                                     n.obs=200));

### And using a lower alpha value for the diamonds to
### make them more transparent

factorLoadingDiamondCIplot(psych::fa(psych::Bechtoldt,
                                     nfactors=2,
                                     n.iter=50,
                                     n.obs=200),
                           alpha=.5,
                           size=1);

## End(Not run)
```

---

factorLoadingHeatmap *Two-dimensional visualisation of factor analyses*

---

**Description**

This function uses the `diamondPlot()` to visualise the results of a factor analyses. Because the factor loadings computed in factor analysis are point estimates, they may vary from sample to sample. The factor loadings for any given sample are usually not relevant; samples are but means to study populations, and so, researchers are usually interested in population values for the factor loadings. However, tables with lots of loadings can quickly become confusing and intimidating. This function aims to facilitate working with and interpreting factor analysis based on confidence intervals by visualising the factor loadings and their confidence intervals.

**Usage**

```
factorLoadingHeatmap(
  fa,
  xlab = "Factor Loading",
  colors = (viridis::viridis_pal()(max(2, fa$factors))),
  labels = NULL,
  showLoadings = FALSE,
  heatmap = FALSE,
  theme = ggplot2::theme_minimal(),
  sortAlphabetically = FALSE,
  digits = 2,
  labs = list(title = NULL, x = NULL, y = NULL),
  themeArgs = list(panel.grid = ggplot2::element_blank(), legend.position = "none",
    axis.text.x = ggplot2::element_blank()),
  ...
)
```

**Arguments**

<code>fa</code>	The object produced by the <code>psych::fa()</code> function from the <code>psych::psych</code> package. It is important that the <code>n.iter</code> argument of <code>psych::fa()</code> was set to a realistic number, because otherwise, no confidence intervals will be available.
<code>xlab</code>	The label for the x axis.
<code>colors</code>	The colors used for the factors. The default uses the discrete <code>viridis()</code> palette, which is optimized for perceptual uniformity, maintaining its properties when printed in grayscale, and designed for colourblind readers. A vector can also be supplied; the colors must be valid arguments to <code>colorRamp()</code> (and therefore, to <code>col2rgb()</code> ).
<code>labels</code>	The labels to use for the items (on the Y axis).
<code>showLoadings</code>	Whether to show the factor loadings or not.
<code>heatmap</code>	Whether to produce a heatmap or use diamond plots.
<code>theme</code>	The ggplot2 theme to use.
<code>sortAlphabetically</code>	Whether to sort the items alphabetically.
<code>digits</code>	Number of digits to round to.
<code>labs</code>	The labels to pass to ggplot2.
<code>themeArgs</code>	Additional theme arguments to pass to ggplot2.
<code>...</code>	Additional arguments will be passed to <code>ggDiamondLayer()</code> . This can be used to set, for example, the transparency (alpha value) of the diamonds to a lower value using e.g. <code>alpha=.5</code> .

**Value**

A `ggplot2::ggplot()` plot with several `ggDiamondLayer()`s is returned.



**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)**See Also**[psych::fa\(\)ss](#), [meansDiamondPlot\(\)](#), [meanSDtoDiamondPlot\(\)](#), [diamondPlot\(\)](#), [ggDiamondLayer\(\)](#)**Examples**

```
## Not run:
### (Not run during testing because it takes too long and
### may generate warnings because of the bootstrapping of
### the confidence intervals)

factorLoadingHeatmap(psych::fa(psych::Bechtoldt,
                              nfactors=2,
                              n.iter=50,
                              n.obs=200));

### And using a lower alpha value for the diamonds to
### make them more transparent

factorLoadingHeatmap(psych::fa(psych::Bechtoldt,
                              nfactors=2,
                              n.iter=50,
                              n.obs=200),
                    alpha=.5,
                    size=1);

## End(Not run)
```

---

`fa_failsafe`*Do factor-analysis, logging warnings and errors*

---

**Description**

Do factor-analysis, logging warnings and errors

**Usage**

```
fa_failsafe(
  ...,
  n.repeatOnWarning = 50,
  warningTolerance = 2,
  silentRepeatOnWarning = FALSE,
  showWarnings = TRUE
)
```

**Arguments**

... The arguments for fa in psych.  
n.repeatOnWarning How often to repeat on warnings (in the hopes of getting a run without warnings).  
warningTolerance How many warnings are accepted.  
silentRepeatOnWarning Whether to be chatty or silent when repeating after warnings.  
showWarnings Whether to show the warnings.

**Value**

A list with the fa object and a warnings and an errors object.

---

findShortestInterval *Find the shortest interval*

---

**Description**

This function takes a numeric vector, sorts it, and then finds the shortest interval and returns its length.

**Usage**

```
findShortestInterval(x)
```

**Arguments**

x The numeric vector.

**Value**

The length of the shortest interval.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**Examples**

```
findShortestInterval(c(1, 2, 4, 7, 20, 10, 15));
```

---

formatCI	<i>Pretty formatting of confidence intervals</i>
----------	--

---

## Description

Pretty formatting of confidence intervals

## Usage

```
formatCI(  
  ci,  
  sep = "; ",  
  prefix = "[",  
  suffix = "]",  
  digits = 2,  
  noZero = FALSE  
)
```

## Arguments

ci	A confidence interval (a vector of 2 elements; longer vectors work, but I guess that wouldn't make sense).
sep	The separator of the values, usually "; " or ", ".
prefix, suffix	The prefix and suffix, usually a type of opening and closing parenthesis/bracket.
digits	The number of digits to which to round the values.
noZero	Whether to strip the leading zero (before the decimal point), as is typically done when following APA style and displaying correlations, $p$ values, and other numbers that cannot reach 1 or more.

## Value

A character vector of one element.

## See Also

[noZero\(\)](#), [formatR\(\)](#), [formatPvalue\(\)](#)

## Examples

```
### With leading zero ...  
formatCI(c(0.55, 0.021));  
  
### ... and without  
formatCI(c(0.55, 0.021), noZero=TRUE);
```

---

formatPvalue	<i>Pretty formatting of p values</i>
--------------	--------------------------------------

---

## Description

Pretty formatting of  $p$  values

## Usage

```
formatPvalue(values, digits = 3, spaces = TRUE, includeP = TRUE)
```

## Arguments

values	The p-values to format.
digits	The number of digits to round to. Numbers smaller than this number will be shown as <.001 or <.0001 etc.
spaces	Whether to include spaces between symbols, operators, and digits.
includeP	Whether to include the 'p' and '='-symbol in the results (the '<' symbol is always included).

## Value

A formatted P value, roughly according to APA style guidelines. This means that the [noZero](#) function is used to remove the zero preceding the decimal point, and p values that would round to zero given the requested number of digits are shown as e.g.  $p < .001$ .

## See Also

[formatCI\(\)](#), [formatR\(\)](#), [noZero\(\)](#)

## Examples

```
formatPvalue(cor.test(mtcars$mpg,
                      mtcars$disp)$p.value);
formatPvalue(cor.test(mtcars$drat,
                      mtcars$qsec)$p.value);
```

---

formatR	<i>Pretty formatting of correlation coefficients</i>
---------	--

---

**Description**

Pretty formatting of correlation coefficients

**Usage**

```
formatR(r, digits = 2)
```

**Arguments**

r	The Pearson correlation to format.
digits	The number of digits to round to.

**Value**

The formatted correlation.

**See Also**

[noZero\(\)](#), [formatCI\(\)](#), [formatPvalue\(\)](#)

**Examples**

```
formatR(cor(mtcars$mpg, mtcars$disp));
```

---

getData	<i>Basic SPSS translation functions</i>
---------	---

---

**Description**

Basic functions to make working with R easier for SPSS users: `getData` and `getDat` provide an easy way to load SPSS datafiles, and `exportToSPSS` to write to a datafile and syntax file that SPSS can import; `filterBy` and `useAll` allow easy temporary filtering of rows from the dataframe; `mediaan` and `modus` compute the median and mode of ordinal or numeric data.

**Usage**

```

getData(
  filename = NULL,
  file = NULL,
  errorMessage = "[defaultErrorMessage]",
  applyRioLabels = TRUE,
  use.value.labels = FALSE,
  to.data.frame = TRUE,
  stringsAsFactors = FALSE,
  silent = FALSE,
  ...
)

getDat(..., dfName = "dat", backup = TRUE)

```

**Arguments**

<code>filename, file</code>	It is possible to specify a path and filename to load here. If not specified, the default R file selection dialogue is shown. <code>file</code> is still available for backward compatibility but will eventually be phased out.
<code>errorMessage</code>	The error message that is shown if the file does not exist or does not have the right extension; <code>[defaultErrorMessage]</code> is replaced with a default error message (and can be included in longer messages).
<code>applyRioLabels</code>	Whether to apply the labels supplied by Rio. This will make variables that has value labels into factors.
<code>use.value.labels</code>	Only useful when reading from SPSS files: whether to read variables with value labels as factors (TRUE) or numeric vectors (FALSE).
<code>to.data.frame</code>	Only useful when reading from SPSS files: whether to return a dataframe or not.
<code>stringsAsFactors</code>	Whether to read strings as strings (FALSE) or factors (TRUE).
<code>silent</code>	Whether to suppress potentially useful information.
<code>...</code>	Additional options, passed on to the function used to import the data (which depends on the extension of the file).
<code>dfName</code>	The name of the dataframe to create in the parent environment.
<code>backup</code>	Whether to backup an object with name <code>dfName</code> , if one already exists in the parent environment.

**Value**

`getData` returns the imported dataframe, with the filename from which it was read stored in the 'filename' attribute.

`getDat` is a simple wrapper for `getData()` which creates a dataframe in the parent environment, by default with the name 'dat'. Therefore, calling `getDat()` in the console will allow the user to select a file, and the data from the file will then be read and be available as 'dat'. If an object with `dfName` (i.e. 'dat' by default) already exists, it will be backed up with a warning. `getDat()` also invisibly returns the `data.frame`.

**Note**

getData() currently can't read from LibreOffice or OpenOffice files. There doesn't seem to be a platform-independent package that allows this. Non-CRAN package ROpenOffice from OmegaHat should be able to do the trick, but fails to install (manual download and installation using <https://www.omegahat.org> produces "ERROR: dependency 'Rcompression' is not available for package 'ROpenOffice'" - and manual download and installation of RCompression produces "Please define LIB\_ZLIB; ERROR: configuration failed for package 'Rcompression'"). If you have any suggestions, please let me know!

**Examples**

```
## Not run:  
### Open a dialogue to read an SPSS file  
getData();  
  
## End(Not run)
```

---

ggBarChart

*Bar chart using ggplot*

---

**Description**

This function provides a simple interface to create a `ggplot2::ggplot()` bar chart.

**Usage**

```
ggBarChart(vector, plotTheme = ggplot2::theme_bw(), ...)
```

**Arguments**

vector	The vector to display in the bar chart.
plotTheme	The theme to apply.
...	And additional arguments are passed to <code>ggplot2::geom_bar()</code> .

**Value**

A `ggplot2::ggplot()` plot is returned.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

[ggplot2::geom\\_bar\(\)](#)

**Examples**

```
ggBarChart(mtcars$cyl);
```

---

ggBoxplot

*Box plot using ggplot*

---

**Description**

This function provides a simple interface to create a [ggplot](#) box plot, organising different boxplots by levels of a factor is desired, and showing row numbers of outliers.

**Usage**

```
ggBoxplot(  
  dat,  
  y = NULL,  
  x = NULL,  
  labelOutliers = TRUE,  
  outlierColor = "red",  
  theme = ggplot2::theme_bw(),  
  ...  
)
```

**Arguments**

dat	Either a vector of values (to display in the box plot) or a dataframe containing variables to display in the box plot.
y	If dat is a dataframe, this is the name of the variable to make the box plot of.
x	If dat is a dataframe, this is the name of the variable (normally a factor) to place on the X axis. Separate box plots will be generate for each level of this variable.
labelOutliers	Whether or not to label outliers.
outlierColor	If labeling outliers, this is the color to use.
theme	The theme to use for the box plot.
...	Any additional arguments will be passed to <a href="#">geom_boxplot</a> .

**Details**

This function is based on JasonAizkalns' answer to a question on Stack Exchange (Cross Validated; see <https://stackoverflow.com/questions/33524669/labeling-outliers-of-boxplots-in-r>).



**Value**

A `ggplot` plot is returned.

**Author(s)**

Jason Aizkalns; implemented in this package (and tweaked a bit) by Gjalt-Jorn Peters.

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

[geom\\_boxplot](#)

**Examples**

```
### A box plot for miles per gallon in the mtcars dataset:
ggBoxplot(mtcars$mpg);

### And separate for each level of 'cyl' (number of cylinder):
ggBoxplot(mtcars, y='mpg', x='cyl');
```

---

ggEasyBar

*Convenience functions for ggplots based on multiple variables*

---

**Description**

These are convenience functions to quickly generate plots for multiple variables, with the variables in the y axis.

**Usage**

```
ggEasyBar(
  data,
  items = NULL,
  labels = NULL,
  sortByMean = TRUE,
  xlab = NULL,
  ylab = NULL,
  scale_fill_function = NULL,
  fontColor = "white",
  fontSize = 2,
  labelMinPercentage = 1,
  showInLegend = "both",
  legendRows = 2,
  legendValueLabels = NULL,
  biAxisLabels = NULL
```

```

)

ggEasyRidge(
  data,
  items = NULL,
  labels = NULL,
  sortByMean = TRUE,
  xlab = NULL,
  ylab = NULL
)

```

### Arguments

<code>data</code>	The dataframe containing the variables.
<code>items</code>	The variable names (if not provided, all variables will be used).
<code>labels</code>	Labels can optionally be provided; if they are, these will be used instead of the variable names.
<code>sortByMean</code>	Whether to sort the variables by mean value.
<code>xlab, ylab</code>	The labels for the x and y axes.
<code>scale_fill_function</code>	The function to pass to <code>ggplot()</code> to provide the colors of the bars. If NULL, set to <code>ggplot2::scale_fill_viridis_d(labels = legendValueLabels, guide = ggplot2::guide_legend = NULL, nrow=legendRows, byrow=TRUE)</code> .
<code>fontColor, fontSize</code>	The color and size of the font used to display the labels
<code>labelMinPercentage</code>	The minimum percentage that a category must reach before the label is printed (in whole percentages, i.e., on a scale from 0 to 100).
<code>showInLegend</code>	What to show in the legend in addition to the values; nothing ("none"), the frequencies ("freq"), the percentages ("perc"), or both ("both"). This is only used if only one variable is shown in the plot; otherwise, after all, the absolute frequencies and percentages differ for each variable.
<code>legendRows</code>	Number of rows in the legend.
<code>legendValueLabels</code>	Labels to use in the legend; must be a vector of the same length as the number of categories in the variables.
<code>biAxisLabels</code>	This can be used to specify labels to use if you want to use labels on both the left and right side. This is mostly useful when plotting single questions or semantic differentials. This must be a list with two character vectors, <code>leftAnchors</code> and <code>rightAnchors</code> , which must each have the same length as the number of items specified in <code>items</code> . See the examples for, well, examples.

### Value

A `ggplot()` plot is returned.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)**See Also**[geom\\_ridgeline\(\)](#), [geom\\_bar\(\)](#)**Examples**

```

ggEasyBar(mtcars, c('gear', 'carb'));
ggEasyRidge(mtcars, c('disp', 'hp'));

### When plotting single questions, if you want to show the anchors:
ggEasyBar(mtcars, c('gear'),
          biAxisLabels=list(leftAnchors="Fewer",
                           rightAnchors="More"));

### Or for multiple questions (for e.g. semantic differentials):
ggEasyBar(mtcars, c('gear', 'carb'),
          biAxisLabels=list(leftAnchors=c("Fewer", "Lesser"),
                           rightAnchors=c("More", "Greater")));

```

ggProportionPlot

*Sample distribution based plotting of proportions***Description**

This function visualises percentages, but avoids a clear cut for the sample point estimate, instead using the confidence (as in confidence interval) to create a gradient. This effectively hinders drawing conclusions on the basis of point estimates, thereby urging a level of caution that is consistent with what the data allows.

**Usage**

```

ggProportionPlot(
  dat,
  items = NULL,
  loCategory = NULL,
  hiCategory = NULL,
  subQuestions = NULL,
  leftAnchors = NULL,
  rightAnchors = NULL,
  compareHiToLo = TRUE,
  showDiamonds = FALSE,
  diamonds.conf.level = 0.95,
  diamonds.alpha = 1,

```

```

na.rm = TRUE,
barHeight = 0.4,
conf.steps = seq(from = 0.001, to = 0.999, by = 0.001),
scale_color = viridis::viridis(option = "viridis", 2, begin = 0.5, end = 1),
scale_fill = viridis::viridis(option = "viridis", 2, begin = 0.5, end = 1),
rank.conf = FALSE,
linetype = 1,
theme = ggplot2::theme_bw(),
returnPlotOnly = TRUE
)

## S3 method for class 'ggProportionPlot'
print(x, ...)

## S3 method for class 'ggProportionPlot'
grid.draw(x, ...)

```

### Arguments

<code>dat</code>	The dataframe containing the items (variables), or a vector.
<code>items</code>	The names of the items (variables). If none are specified, all variables in the dataframe are used.
<code>loCategory</code>	The value of the low category (usually 0). If not provided, the minimum value is used.
<code>hiCategory</code>	The value of the high category (usually 1). If not provided, the maximum value is used.
<code>subQuestions</code>	The labels to use for the variables (for example, different questions). The variable names are used if these aren't provided.
<code>leftAnchors</code>	The labels for the low categories. The values are used if these aren't provided.
<code>rightAnchors</code>	The labels for the high categories. The values are used if these aren't provided.
<code>compareHiToLo</code>	Whether to compare the percentage of low category values to the total of the low category values and the high category values, or whether to ignore the high category values and compute the percentage of low category values relative to all cases. This can be useful when a variable has more than two values, and you only want to know/plot the percentage relative to the total number of cases.
<code>showDiamonds</code>	Whether to add diamonds to illustrate the confidence intervals.
<code>diamonds.conf.level</code>	The confidence level of the diamonds' confidence intervals.
<code>diamonds.alpha</code>	The alpha channel (i.e. transparency, or rather 'obliqueness') of the diamonds.
<code>na.rm</code>	Whether to remove missing values.
<code>barHeight</code>	The height of the bars, or rather, half the height. Use .5 to completely fill the space.
<code>conf.steps</code>	The number of steps to use to generate the confidence levels for the proportion.

<code>scale_color</code> , <code>scale_fill</code>	A vector with two values (valid colors), that are used for the colors (stroke) and fill for the gradient; both vectors should normally be the same, but if you feel adventurous, you can play around with the number of <code>conf.steps</code> and this. If you specify only one color, no gradient is used but a single color (i.e. specifying the same single color for both <code>scale_color</code> and <code>scale_fill</code> simply draws bars of that color).
<code>rank.conf</code>	Whether to let the fill and color gradients use the confidence or the ranked confidence.
<code>linetype</code>	The <code>linetype()</code> to use (0 = blank, 1 = solid, 2 = dashed, 3 = dotted, 4 = dotdash, 5 = longdash, 6 = twodash).
<code>theme</code>	The theme to use.
<code>returnPlotOnly</code>	Whether to only return the <code>ggplot2()</code> plot or the full object including intermediate values and objects.
<code>x</code>	The object to print/plot.
<code>...</code>	Any additional arguments are passed on to <code>print</code> and <code>grid.draw</code> .

### Details

This function used `confIntProp()` to compute confidence intervals for proportions at different levels of confidence. The confidence interval bounds at those levels of confidence are then used to draw rectangles with colors in a gradient that corresponds to the confidence level.

Note that perceptually, the gradient may not look continuous because at the borders between lighter and darker rectangles, the shade of the lighter rectangle is perceived as even lighter than it is, and the shade of the darker rectangle is perceived as even darker. This makes it seem as if each rectangle is coloured with a gradient in the opposite direction.

### Value

A `ggplot2()` object (if `returnPlotOnly` is TRUE), or an object containing that `ggplot2()` object and intermediate products.

### Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### See Also

`confIntProp()` and `binom.test()`

### Examples

```
### V/S (no idea what this is: ?mtcars only mentions 'V/S' :-))
### and transmission (automatic vs manual)
ggProportionPlot(mtcars, items=c('vs', 'am'));
```

```

### Number of cylinders, by default comparing lowest value
### (4) to highest (8):
ggProportionPlot(mtcars, items=c('cyl'));

## Not run:
### Not running these to save time during package building/checking

### We can also compare 4 to 6:
ggProportionPlot(mtcars, items=c('cyl'),
                 hiCategory=6);

### Now compared to total records, instead of to
### highest value (hiCategory is ignored then)
ggProportionPlot(mtcars, items=c('cyl'),
                 compareHiToLo=FALSE);

### And for 6 cylinders:
ggProportionPlot(mtcars, items=c('cyl'),
                 loCategory=6, compareHiToLo=FALSE);

### And for 8 cylinders:
ggProportionPlot(mtcars, items=c('cyl'),
                 loCategory=8, compareHiToLo=FALSE);

### And for 8 cylinders with different labels
ggProportionPlot(mtcars, items=c('cyl'),
                 loCategory=8,
                 subQuestions='Cylinders',
                 leftAnchors="Eight",
                 rightAnchors="Four\nor\nsix",
                 compareHiToLo=FALSE);

### ... And showing the diamonds for the confidence intervals
ggProportionPlot(mtcars, items=c('cyl'),
                 loCategory=8,
                 subQuestions='Cylinders',
                 leftAnchors="Eight",
                 rightAnchors="Four\nor\nsix",
                 compareHiToLo=FALSE,
                 showDiamonds=TRUE);

## End(Not run)

### Using less steps for the confidence levels and changing
### the fill colours
ggProportionPlot(mtcars,
                 items=c('vs', 'am'),
                 showDiamonds = TRUE,
                 scale_fill = c("#B63679FF", "#FCFDBFFF"),
                 conf.steps=seq(from=0.0001, to=.9999, by=.2));

```

**Description**

This function creates a qq-plot with a confidence interval.

**Usage**

```
ggqq(
  x,
  distribution = "norm",
  ...,
  ci = TRUE,
  line.estimate = NULL,
  conf.level = 0.95,
  sampleSizeOverride = NULL,
  observedOnX = TRUE,
  scaleExpected = TRUE,
  theoryLab = "Theoretical quantiles",
  observeLab = "Observed quantiles",
  theme = ggplot2::theme_bw()
)
```

**Arguments**

<code>x</code>	A vector containing the values to plot.
<code>distribution</code>	The distribution to (a 'd' and 'q' are prepended, and the resulting functions are used, e.g. <code>dnorm</code> and <code>qnorm</code> for the normal curve).
<code>...</code>	Any additional arguments are passed to the quantile function (e.g. <code>qnorm</code> ). Because of these dots, any following arguments must be named explicitly.
<code>ci</code>	Whether to show the confidence interval.
<code>line.estimate</code>	Whether to show the line showing the match with the specified distribution (e.g. the normal distribution).
<code>conf.level</code>	The confidence of the confidence level around the estimate for the specified distribution.
<code>sampleSizeOverride</code>	It can be desirable to get the confidence intervals for a different sample size (when the sample size is very large, for example, such as when this plot is generated by the function <code>normalityAssessment</code> ). That different sample size can be specified here.
<code>observedOnX</code>	Whether to plot the observed values (if TRUE) or the theoretically expected values (if FALSE) on the X axis. The other is plotted on the Y axis.
<code>scaleExpected</code>	Whether the scale the expected values to match the scale of the variable. This option is provided to be able to mimic SPSS' Q-Q plots.

theoryLab	The label for the theoretically expected values (on the Y axis by default).
observeLab	The label for the observed values (on the Y axis by default).
theme	The theme to use.

### Details

This is strongly based on the answer by user Floo0 to a Stack Overflow question at Stack Exchange (see <https://stackoverflow.com/questions/4357031/qqnorm-and-qqline-in-ggplot2/27191036#27191036>), also posted at GitHub (see <https://gist.github.com/rentrop/d39a8406ad8af2a1066c>). That code is in turn based on the qqPlot() function from the car package.

### Value

A `ggplot` plot is returned.

### Author(s)

John Fox and Floo0; implemented in this package (and tweaked a bit) by Gjalt-Jorn Peters.  
 Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### Examples

```
ggqq(mtcars$mpg);
```

---

ggSave	<i>Save a ggplot with specific defaults</i>
--------	---

---

### Description

This function is vectorized over all argument except 'plot': so if you want to save multiple versions, simply provide vectors. Vectors of length 1 will be recycled using `rep()`; otherwise vectors have to all be the same length as file.

### Usage

```
ggSave(
  file = NULL,
  plot = ggplot2::last_plot(),
  width = ufs::opts$get("ggSaveFigWidth"),
  height = ufs::opts$get("ggSaveFigHeight"),
  units = ufs::opts$get("ggSaveUnits"),
  dpi = ufs::opts$get("ggSaveDPI"),
  device = NULL,
  type = NULL,
  bg = "transparent",
  ...
)
```



**Arguments**

file	The file where to save to.
plot	The plot to save; if omitted, the last drawn plot is saved.
height, width	The dimensions of the plot, specified in units.
units	The units, 'cm', 'mm', or 'in'.
dpi	The resolution (dots per inch). This argument is vectorized.
device	The graphic device; is inferred from the file if not specified.
type	An additional arguments for the graphic device.
bg	The background (e.g. 'white').
...	Any additional arguments are passed on to <code>ggplot2::ggsave()</code> .

**Value**

The plot, invisibly.

**Examples**

```
plot <- ufs::ggBoxplot(mtcars, 'mpg');
ggSave(file=tempfile(fileext=".png"), plot=plot);
```

---

heading	<i>Print a heading</i>
---------	------------------------

---

**Description**

This is just a convenience function to print a markdown or HTML heading at a given 'depth'.

**Usage**

```
heading(
  ...,
  headingLevel = ufs::opts$get("defaultHeadingLevel"),
  output = "markdown",
  cat = TRUE
)
```

**Arguments**

...	The heading text: pasted together with no separator.
headingLevel	The level of the heading; the default can be set with e.g. <code>ufs::opts\$set(defaultHeadingLevel=1)</code> .
output	Whether to output to HTML ("html") or markdown (anything else).
cat	Whether to cat (print) the heading or just invisibly return it.

**Value**

The heading, invisibly.

**Examples**

```
heading("Hello ", "World", headingLevel=5);  
### This produces: "\n\n##### Hello World\n\n"
```

---

ifelseObj

*Conditional returning of an object*

---

**Description**

The ifelseObj function just evaluates a condition, returning one object if it's true, and another if it's false.

**Usage**

```
ifelseObj(condition, ifTrue, ifFalse)
```

**Arguments**

condition	Condition to evaluate.
ifTrue	Object to return if the condition is true.
ifFalse	Object to return if the condition is false.

**Value**

One of the two objects

**Examples**

```
dat <- ifelseObj(sample(c(TRUE, FALSE), 1), mtcars, Orange);
```

---

 insertFigureCaption    *Insert numbered caption*


---

### Description

These functions can be used to manually insert a numbered caption. These functions have been designed to work well with `setFigCapNumbering()` and `setTabCapNumbering()`. This is useful when inserting figures or tables in an RMarkdown document when you use automatic caption numbering for knitr chunks, but are inserting a table or figure that isn't produced in a knitr chunk while still retaining the automatic numbering. `insertNumberedCaption()` is the general-purpose function; you will typically only use `insertFigureCaption()` and `insertTableCaption()`.

### Usage

```
insertFigureCaption(
  captionText = "",
  captionName = "fig.cap",
  prefix = getOption(paste0(optionName, "_prefix"), "Figure %s: "),
  suffix = getOption(paste0(optionName, "_suffix"), ""),
  optionName = paste0("setCaptionNumbering_", captionName),
  resetCounterTo = NULL
)
```

```
insertNumberedCaption(
  captionText = "",
  captionName = "fig.cap",
  prefix = getOption(paste0(optionName, "_prefix"), "Figure %s: "),
  suffix = getOption(paste0(optionName, "_suffix"), ""),
  optionName = paste0("setCaptionNumbering_", captionName),
  resetCounterTo = NULL
)
```

```
insertTableCaption(
  captionText = "",
  captionName = "tab.cap",
  prefix = getOption(paste0(optionName, "_prefix"), "Table %s: "),
  suffix = getOption(paste0(optionName, "_suffix"), ""),
  optionName = paste0("setCaptionNumbering_", captionName),
  resetCounterTo = NULL
)
```

### Arguments

captionText	The text of the caption.
captionName	The name of the caption; by default, for tables, "tab.cap".
prefix, suffix	The prefix and suffix texts; <code>base::sprintf()</code> is used to insert the number in the position taken up by <code>\%s</code> .

optionName      The name of the option to use to save the number counter.  
resetCounterTo   If a numeric value, the counter is reset to that value.

**Value**

The caption in a character vector.

**Examples**

```
insertNumberedCaption("First caption");  
insertNumberedCaption("Second caption");  
sectionNumber <- 12;  
insertNumberedCaption("Third caption",  
                      prefix = paste0("Table ",  
                                      sectionNumber,  
                                      ".%s: "));
```

---

iqrOutlier	<i>Identify outliers according to the IQR criterion</i>
------------	---

---

**Description**

The IQR criterion holds that any value lower than one-and-a-half times the interquartile range below the first quartile, or higher than one-and-a-half times the interquartile range above the third quartile, is an outlier. This function returns a logical vector that identifies those outliers.

**Usage**

```
iqrOutlier(x)
```

**Arguments**

x                      The vector to scan for outliers.

**Value**

A logical vector where TRUE identifies outliers.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

[IQR](#)

## Examples

```
### One outlier in the miles per gallon
iqrOutlier(mtcars$mpg);
```

---

irpplot

*Visualising individual response patterns*

---

## Description

Visualising individual response patterns

## Usage

```
irpplot(
  data,
  row,
  columns,
  dataName = NULL,
  title = paste("Row", row, "in dataset", dataName)
)
```

## Arguments

data	A dataframe with the dataset containing the responses.
row	A vector with indices of the rows for which you want the individual response patterns. These can be either the relevant row numbers, or if character row names are set, the names of the relevant rows.
columns	A vector with the names of the variables you want the individual response patterns for.
dataName, title	Optionally, you can override the dataset name that is used in the title; or, the title (the dataset name is only used in the title).

## Value

A `ggplot2::ggplot()`.

## Examples

```
### Get a dataset
dat <- ufs::bfi;

### Show the individual responses for
### the tenth participant
irpplot(dat, 10, 1:20);
```

```
### Set some missing values
dat[10, c(1, 5, 15)] <- NA;

### Show the individual responses again
irpplot(dat, 10, 1:20);
```

---

is.nr	NULL and NA 'proof' checking of whether something is a number
-------	---

---

### Description

Convenience function that returns TRUE if the argument is not null, not NA, and is.numeric.

### Usage

```
is.nr(x)
```

### Arguments

x                    The value or vector to check.

### Value

TRUE or FALSE.

### Examples

```
is.nr(8);     ### Returns TRUE
is.nr(NULL); ### Returns FALSE
is.nr(NA);   ### Returns FALSE
```

---

is.odd	Checking whether numbers are odd or even
--------	--

---

### Description

Checking whether numbers are odd or even

### Usage

```
is.odd(vector)

is.even(vector)
```

**Arguments**

vector            The vector to process

**Value**

A logical vector.

**Examples**

```
is.odd(4);
```

---

isTrue            *More flexible version of isTRUE*

---

**Description**

Returns TRUE for TRUE elements, FALSE for FALSE elements, and whatever is specified in na for NA items.

**Usage**

```
isTrue(x, na = FALSE)
```

**Arguments**

x                    The vector to check for TRUE, FALSE, and NA values.  
na                    What to return for NA values.

**Value**

A logical vector.

**Examples**

```
isTrue(c(TRUE, FALSE, NA));  
isTrue(c(TRUE, FALSE, NA), na=TRUE);
```

---

`kblXtra`*Wrapper for kableExtra for consistent ufs table styling*

---

## Description

Wrapper for kableExtra for consistent ufs table styling

## Usage

```
kblXtra(  
  x,  
  digits = 2,  
  format = "html",  
  escape = FALSE,  
  print = TRUE,  
  viewer = FALSE,  
  kable_classic = FALSE,  
  lightable_options = "striped",  
  html_font = "\"Arial Narrow\"", "\"Source Sans Pro\"", sans-serif",  
  full_width = TRUE,  
  table.attr = "style='border:0px solid black !important;'",  
  ...  
)
```

## Arguments

<code>x</code>	The dataframe to print
<code>digits</code> , <code>format</code> , <code>escape</code> , <code>table.attr</code> , <code>lightable_options</code> , <code>html_font</code> , <code>full_width</code>	Defaults that are passed to <code>knitr::kable()</code>
<code>print</code>	Whether to print the table
<code>viewer</code>	Whether to show the table in the viewer
<code>kable_classic</code>	Whether to call <code>kable_classic</code> ; otherwise, <code>kable_styling</code> is called.
<code>...</code>	Additional arguments are passed to <code>knitr::kable()</code>

## Value

The table, invisibly.

## Examples

```
kblXtra(mtcars);
```



---

knitAndSave	<i>knitAndSave</i>
-------------	--------------------

---

## Description

knitAndSave

## Usage

```
knitAndSave(
  plotToDraw,
  figCaption,
  file = NULL,
  path = NULL,
  figWidth = ufs::opts$get("ggSaveFigWidth"),
  figHeight = ufs::opts$get("ggSaveFigHeight"),
  units = ufs::opts$get("ggSaveUnits"),
  dpi = ufs::opts$get("ggSaveDPI"),
  catPlot = ufs::opts$get("knitAndSave.catPlot"),
  ...
)
```

## Arguments

plotToDraw	The plot to knit using <a href="#">knitFig()</a> and save using <a href="#">ggSave()</a> .
figCaption	The caption of the plot (used as filename if no filename is specified).
file, path	The filename to use when saving the plot, or the path where to save the file if no filename is provided (if path is also omitted, <a href="#">getWd()</a> is used).
figWidth, figHeight	The plot dimensions, by default specified in inches (but 'units' can be set which is then passed on to <a href="#">ggSave()</a> ).
units, dpi	The units and DPI of the image which are then passed on to <a href="#">ggSave()</a> .
catPlot	Whether to use <a href="#">cat()</a> to print the knitr fragment.
...	Additional arguments are passed on to <a href="#">ggSave()</a> . Note that file (and ...) are vectorized (see the <a href="#">ggSave()</a> manual page).

## Value

The [knitFig\(\)](#) result, visibly.

## Examples

```
## Not run: plot <- ggBoxplot(mtcars, 'mpg');
knitAndSave(plot, figCaption="a boxplot", file=tempfile(fileext=".png"));
## End(Not run)
```

knitFig

*Easily knit a custom figure fragment***Description**

This function was written to make it easy to knit figures with different, or dynamically generated, widths and heights (and captions) in the same chunk when working with R Markdown.

**Usage**

```
knitFig(
  plotToDraw,
  template = getOption("ufs.knitFig.template", NULL),
  figWidth = ufs::opts$get("ggSaveFigWidth"),
  figHeight = ufs::opts$get("ggSaveFigHeight"),
  figCaption = "A plot.",
  chunkName = NULL,
  returnRaw = FALSE,
  catPlot = ufs::opts$get("knitFig.catPlot"),
  ...
)
```

**Arguments**

plotToDraw	The plot to draw, e.g. a <a href="#">ggplot</a> plot.
template	A character value with the <a href="#">knit_expand</a> template to use.
figWidth	The width to set for the figure (in inches).
figHeight	The height to set for the figure (in inches).
figCaption	The caption to set for the figure.
chunkName	Optionally, the name for the chunk. To avoid problems because multiple chunks have the name "unnamed-chunk-1", if no chunk name is provided, <a href="#">digest::digest()</a> is used to generate an MD5-hash from <a href="#">Sys.time</a> .
returnRaw	Whether to <a href="#">cat()</a> the result (TRUE) or whether to return it as <a href="#">knitr::asis_output()</a> object (FALSE).
catPlot	Whether to use the <a href="#">base::cat()</a> function to print the code for the plot, and return the result invisibly. If not, the result is returned visible, and so probably printed anyway.
...	Any additional arguments are passed on to <a href="#">knit_expand</a> .

**Value**

This function returns nothing, but uses [knit\\_expand](#) and [knit](#) to [cat](#) the result.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)**See Also**[knit\\_expand](#) and [knit](#)**Examples**

```
## Not run: knitFig(ggBoxplot(mtcars, 'mpg'))
```

---

makeScales
------------

---

*Title***Description**

Title

**Usage**

```
makeScales(data, scales, append = TRUE)
```

**Arguments**

data	The dataframe containing the variables (the items).
scales	A list of character vectors with the items in each scale, where each vectors' name is the name of the scale.
append	Whether to return the dataframe including the new variables (TRUE), or a dataframe with only those new variables (FALSE).

**Value**

Either a dataframe with the newly created variables, or the supplied dataframe with the newly created variables appended.

**Examples**

```
### First generate a list with the scales
scales <- list(scale1 = c('mpg', 'cyl'), scale2 = c('disp', 'hp'));

### Create the scales and add them to the dataframe
makeScales(mtcars, scales);
```



---

meanConfInt	<i>A confidence interval for the mean</i>
-------------	---

---

### Description

A confidence interval for the mean

### Usage

```
meanConfInt(  
  vector = NULL,  
  mean = NULL,  
  sd = NULL,  
  n = NULL,  
  se = NULL,  
  conf.level = 0.95  
)  
  
## S3 method for class 'meanConfInt'  
print(x, digits = 2, ...)
```

### Arguments

vector	A vector with raw data points - either specify this or a mean and then either an sd and n or an se.
mean	A mean.
sd, n	A standard deviation and sample size; can be specified to compute the standard error.
se	The standard error (cna be specified instead of sd and n).
conf.level	The confidence level of the interval.
x, digits, ...	Respectively the object to print, the number of digits to round to, and any additional arguments to pass on to the print function.

### Value

And object with elements input, intermediate, and output, where output holds the result in list ci.

### Examples

```
meanConfInt(mean=5, sd=2, n=20);
```

---

meansDiamondPlot      *Diamond plots*

---

### Description

This function generates a so-called diamond plot: a plot based on the forest plots that are commonplace in meta-analyses. The underlying idea is that point estimates are uninformative, and it would be better to focus on confidence intervals. The problem of the points with errorbars that are commonly employed is that the focus the audience's attention on the upper and lower bounds, even though those are the least relevant values. Using diamonds remedies this.

### Usage

```
meansDiamondPlot(
  data,
  items = NULL,
  labels = NULL,
  decreasing = NULL,
  conf.level = 0.95,
  showData = TRUE,
  dataAlpha = 0.1,
  dataSize = 3,
  dataColor = "#444444",
  diamondColors = NULL,
  jitterWidth = 0.5,
  jitterHeight = 0.4,
  returnLayerOnly = FALSE,
  xlab = "Scores and means",
  ylab = NULL,
  theme = ggplot2::theme_bw(),
  xbreaks = "auto",
  outputFile = NULL,
  outputWidth = 10,
  outputHeight = 10,
  ggsaveParams = ufs::opts$get("ggsaveParams"),
  dat = NULL,
  ...
)
```

### Arguments

<code>data, dat</code>	The dataframe containing the variables ( <code>items</code> ) to show in the diamond plot (the name <code>dat</code> for this argument is deprecated but still works for backward compatibility).
<code>items</code>	Optionally, the names (or numeric indices) of the variables ( <code>items</code> ) to show in the diamond plot. If <code>NULL</code> , all columns (variables, <code>items</code> ) will be used.

labels	A character vector of labels to use instead of column names from the dataframe.
decreasing	Whether to sort the variables (rows) in the diamond plot decreasing (TRUE), increasing (FALSE), or not at all (NULL).
conf.level	The confidence of the confidence intervals.
showData	Whether to show the raw data or not.
dataAlpha	This determines the alpha (transparency) of the data points. Note that argument alpha can be used to set the alpha of the diamonds; this is eventually passed on to <code>ggDiamondLayer()</code> .
dataSize	The size of the data points.
dataColor	The color of the data points.
diamondColors	A vector of the same length as there are rows in the dataframe, to manually specify colors for the diamonds.
jitterWidth	How much to jitter the individual datapoints horizontally.
jitterHeight	How much to jitter the individual datapoints vertically.
returnLayerOnly	Set this to TRUE to only return the <code>ggplot()</code> layer of the diamondplot, which can be useful to include it in other plots.
xlab, ylab	The labels of the X and Y axes.
theme	The theme to use.
xbreaks	Where the breaks (major grid lines, ticks, and labels) on the x axis should be.
outputFile	A file to which to save the plot.
outputWidth, outputHeight	Width and height of saved plot (specified in centimeters by default, see <code>ggsaveParams</code> ).
ggsaveParams	Parameters to pass to <code>ggsave</code> when saving the plot.
...	Additional arguments are passed to <code>diamondPlot()</code> and eventually to <code>ggDiamondLayer()</code> . This can be used to, for example, specify two or more colors to use to generate a gradient (using <code>generateColors</code> and maybe <code>fullColorRange</code> ).

**Value**

A `ggplot()` plot with a `ggDiamondLayer()` is returned.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

See `diamondPlot()`, `meanSDtoDiamondPlot()`, `ggDiamondLayer()`, `factorLoadingDiamondCIplot()`

**Examples**

```

tmpDf <- data.frame(item1 = rnorm(50, 1.6, 1),
                    item2 = rnorm(50, 2.6, 2),
                    item3 = rnorm(50, 4.1, 3));

### A simple diamond plot
meansDiamondPlot(tmpDf);

### A diamond plot with manually
### specified labels and colors
meansDiamondPlot(tmpDf,
                  labels=c('First',
                           'Second',
                           'Third'),
                  diamondColors=c('blue', 'magenta', 'yellow'));

### Using a gradient for the colors
meansDiamondPlot(tmpDf,
                  labels=c('First',
                           'Second',
                           'Third'),
                  generateColors = c("magenta", "cyan"),
                  fullColorRange = c(1,5));

```

---

meansDiamondPlotjmv     *Diamond plot: means*

---

**Description**

Diamond plot: means

**Usage**

```
meansDiamondPlotjmv(data, items, conf.level = 95, showData = TRUE)
```

**Arguments**

```

data          .
items         .
conf.level    .
showData      .

```

**Value**

A results object containing:



results\$text	a html
results\$diamondPlot	an image

---

meanSDtoDiamondPlot    *A diamond plot based on means, standard deviations, and sample sizes*

---

### Description

This function generates a so-called diamond plot: a plot based on the forest plots that are commonplace in meta-analyses. The underlying idea is that point estimates are uninformative, and it would be better to focus on confidence intervals. The problem of the points with errorbars that are commonly employed is that the focus the audience's attention on the upper and lower bounds, even though those are the least relevant values. Using diamonds remedies this.

### Usage

```
meanSDtoDiamondPlot(
  dat = NULL,
  means = 1,
  sds = 2,
  ns = 3,
  labels = NULL,
  colorCol = NULL,
  conf.level = 0.95,
  xlab = "Means",
  outputFile = NULL,
  outputWidth = 10,
  outputHeight = 10,
  ggsaveParams = ufs::opts$get("ggsaveParams"),
  ...
)
```

### Arguments

dat	The dataset containing the means, standard deviations, sample sizes, and possible labels and manually specified colors.
means	Either the column in the dataframe containing the means, as numeric or as character index, or a vector of means.
sds	Either the column in the dataframe containing the standard deviations, as numeric or as character index, or a vector of standard deviations.
ns	Either the column in the dataframe containing the sample sizes, as numeric or as character index, or a vector of sample sizes.
labels	Optionally, either the column in the dataframe containing labels, as numeric or as character index, or a vector of labels.

colorCol	Optionally, either the column in the dataframe containing manually specified colours, as numeric or as character index, or a vector of manually specified colours.
conf.level	The confidence of the confidence intervals.
xlab	The label for the x axis.
outputFile	A file to which to save the plot.
outputWidth, outputHeight	Width and height of saved plot (specified in centimeters by default, see <code>ggsaveParams</code> ).
ggsaveParams	Parameters to pass to <code>ggsave</code> when saving the plot.
...	Additional arguments are passed to <code>diamondPlot()</code> and eventually to <code>ggDiamondLayer()</code> . This can be used to, for example, specify two or more colors to use to generate a gradient (using <code>generateColors</code> and maybe <code>fullColorRange</code> ).

**Value**

A `ggplot()` plot with a `ggDiamondLayer()` is returned.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

[meansDiamondPlot\(\)](#), [diamondPlot\(\)](#), [factorLoadingDiamondCIplot\(\)](#), [ggDiamondLayer\(\)](#)

**Examples**

```
tmpDf <- data.frame(means = c(1, 2, 3),
                   sds = c(1.5, 3, 5),
                   ns = c(2, 4, 10),
                   labels = c('first', 'second', 'third'),
                   color = c('purple', 'grey', 'orange'));

### A simple diamond plot
meanSDtoDiamondPlot(tmpDf);

### A simple diamond plot with labels
meanSDtoDiamondPlot(tmpDf, labels=4);

### When specifying column names, specify column
### names for all columns
meanSDtoDiamondPlot(tmpDf, means='means',
                   sds='sds', ns='ns',
                   labels='labels');

### A diamond plot using the specified colours
meanSDtoDiamondPlot(tmpDf, labels=4, colorCol=5);
```

```

### A diamond plot using automatically generated colours
### using a gradient
meanSDtoDiamondPlot(tmpDf,
                    generateColors=c('green', 'red'));

### A diamond plot using automatically generated colours
### using a gradient, specifying the minimum and maximum
### possible values that can be attained
meanSDtoDiamondPlot(tmpDf,
                    generateColors=c('red', 'yellow', 'blue'),
                    fullColorRange=c(0, 5));

```

---

multiResponse

*Generate a table for multiple response questions*


---

### Description

The multiResponse function mimics the behavior of the table produced by SPSS for multiple response questions.

### Usage

```

multiResponse(
  data,
  items = NULL,
  regex = NULL,
  perlRegex = TRUE,
  endorsedOption = 1
)

```

### Arguments

data	Dataframe containing the variables to display.
items, regex	Arguments items and regex can be used to specify which variables to process. items should contain the variable (column) names (or indices), and regex should contain a regular expression used to match to the column names of the dataframe. If none is provided, all variables in the dataframe are processed.
perlRegex	Whether to use the perl engine to match the regex.
endorsedOption	Which value represents the endorsed option (note that producing this kind of table requires dichotomous items, where each variable is either endorsed or not endorsed, so this is also a way to treat other variables as dichotomous).

### Value

A dataframe with columns Option, Frequency, Percentage, and Percentage of (X) cases, where X is the number of cases.

**Author(s)**

Ananda Mahto; implemented in this package (and tweaked a bit) by Gjalt-Jorn Peters.

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**References**

This function is based on the excellent and extensive Stack Exchange answer by Ananda Mahto at <https://stackoverflow.com/questions/9265003/analysis-of-multiple-response>.

**Examples**

```
multiResponse(mtcars, c('vs', 'am'));
```

---

multiResponsejmv	<i>Multi Response</i>
------------------	-----------------------

---

**Description**

Multi Response

**Usage**

```
multiResponsejmv(data, items, endorsedOption = 1)
```

**Arguments**

```
data          .
items         .
endorsedOption .
```

**Value**

A results object containing:

```
results$table      a table
```

Tables can be converted to data frames with `asDF` or `as.data.frame`. For example:

```
results$table$asDF
as.data.frame(results$table)
```

---

`multiVarFreq`*Generate a table collapsing frequencies of multiple variables*

---

### Description

This function can be used to efficiently combine the frequencies of variables with the same possible values. The frequencies are collapsed into a table with the variable names as row names and the possible values as column (variable) names.

### Usage

```
multiVarFreq(data, items = NULL, labels = NULL, sortByMean = TRUE)
```

### Arguments

<code>data</code>	The dataframe containing the variables.
<code>items</code>	The variable names.
<code>labels</code>	Labels can be provided which will be set as row names when provided.
<code>sortByMean</code>	Whether to sort the rows by mean value for each variable (only sensible if the possible values are numeric).

### Value

The resulting dataframe, but with class 'multiVarFreq' prepended to allow pretty printing.

### Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### See Also

[table\(\)](#)

### Examples

```
multiVarFreq(mtcars, c('gear', 'carb'));
```

---

normalHist	<i>normalHist</i>
------------	-------------------

---

### Description

normalHist generates a histogram with a density curve and a normal density curve.

### Usage

```
normalHist(
  vector,
  histColor = "#0000CC",
  distributionColor = "#0000CC",
  normalColor = "#00CC00",
  distributionLineSize = 1,
  normalLineSize = 1,
  histAlpha = 0.25,
  xLabel = NULL,
  yLabel = NULL,
  normalCurve = TRUE,
  distCurve = TRUE,
  breaks = 30,
  theme = ggplot2::theme_minimal(),
  rug = NULL,
  jitteredRug = TRUE,
  rugSides = "b",
  rugAlpha = 0.2,
  returnPlotOnly = FALSE
)

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

### Arguments

vector	A numeric vector.
histColor	The colour to use for the histogram.
distributionColor	The colour to use for the density curve.
normalColor	The colour to use for the normal curve.
distributionLineSize	The line size to use for the distribution density curve.
normalLineSize	The line size to use for the normal curve.
histAlpha	Alpha value ('opaqueness', as in, versus transparency) of the histogram.
xLabel	Label to use on x axis.

yLabel	Label to use on y axis.
normalCurve	Whether to display the normal curve.
distCurve	Whether to display the curve showing the distribution of the observed data.
breaks	The number of breaks to use (this is equal to the number of bins minus one, or in other words, to the number of bars minus one).
theme	The theme to use.
rug	Whether to add a rug (i.e. lines at the bottom that correspond to individual datapoints).
jitteredRug	Whether to jitter the rug (useful for variables with several datapoints sharing the same value).
rugSides	This is useful when the histogram will be rotated; for example, this can be set to 'r' if the histogram is rotated 270 degrees.
rugAlpha	Alpha value to use for the rug. When there is a lot of overlap, this can help get an idea of the number of datapoints at 'popular' values.
returnPlotOnly	Whether to return the usual normalHist object that also contains all settings and intermediate objects, or whether to only return the <code>ggplot2::ggplot()</code> plot.
x	The object to print.
...	Any additional arguments are passed to the default print method.

### Value

An object, with the following elements:

input	The input when the function was called.
intermediate	The intermediate numbers and distributions.
dat	The dataframe used to generate the plot.
plot	The histogram.

### Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### Examples

```
normalHist(mtcars$mpg)
```

---

noZero	<i>Remove one or more zeroes before the decimal point</i>
--------	---

---

**Description**

Remove one or more zeroes before the decimal point

**Usage**

```
noZero(str)
```

**Arguments**

str            The character string to process.

**Value**

The processed string.

**See Also**

[formatCI\(\)](#), [formatR\(\)](#), [formatPvalue\(\)](#)

**Examples**

```
noZero("0.3");
```

---

opts	<i>Options for the ufs package</i>
------	------------------------------------

---

**Description**

The `ufs::opts` object contains three functions to set, get, and reset options used by the `ufs` package. Use `ufs::opts$set` to set options, `ufs::opts$get` to get options, or `ufs::opts$reset` to reset specific or all options to their default values.

**Usage**

```
opts
```

**Format**

An object of class `list` of length 5.



## Details

It is normally not necessary to get or set ufs options.

The following arguments can be passed:

... For `ufs::opts$set`, the dots can be used to specify the options to set, in the format `option = value`, for example, `tableOutput = c("console", "viewer")`. For `ufs::opts$reset`, a list of options to be reset can be passed.

**option** For `ufs::opts$set`, the name of the option to set.

**default** For `ufs::opts$get`, the default value to return if the option has not been manually specified.

The following options can be set:

**tableOutput** Where to show some tables.

## Examples

```
### Get the default columns in the variable view
ufs::opts$get("tableOutput");

### Set it to a custom version
ufs::opts$set(tableOutput = c("values", "level"));

### Check that it worked
ufs::opts$get("tableOutput");

### Reset this option to its default value
ufs::opts$reset("tableOutput");

### Check that the reset worked, too
ufs::opts$get("tableOutput");
```

---

pomegaSq

*The distribution of Omega Squared*

---

## Description

These functions use some conversion to and from the  $F$  distribution to provide the Omega Squared distribution.

## Usage

```
pomegaSq(q, df1, df2, populationOmegaSq = 0, lower.tail = TRUE)
```

```
qomegaSq(p, df1, df2, populationOmegaSq = 0, lower.tail = TRUE)
```

```
romegaSq(n, df1, df2, populationOmegaSq = 0)
```

```
domegaSq(x, df1, df2, populationOmegaSq = 0)
```

**Arguments**

<code>df1, df2</code>	Degrees of freedom for the numerator and the denominator, respectively.
<code>populationOmegaSq</code>	The value of Omega Squared in the population; this determines the center of the Omega Squared distribution. This has not been implemented yet in this version of ufs. If anybody has the inverse of <code>convert.ncf.to.omegasq()</code> for me, I'll happily integrate this.
<code>lower.tail</code>	logical; if TRUE (default), probabilities are the likelihood of finding an Omega Squared smaller than the specified value; otherwise, the likelihood of finding an Omega Squared larger than the specified value.
<code>p</code>	Vector of probabilities ( $p$ -values).
<code>n</code>	Desired number of Omega Squared values.
<code>x, q</code>	Vector of quantiles, or, in other words, the value(s) of Omega Squared.

**Details**

The functions use `convert.omegasq.to.f()` and `convert.f.to.omegasq()` to provide the Omega Squared distribution.

**Value**

`domegaSq` gives the density, `pomegaSq` gives the distribution function, `qomegaSq` gives the quantile function, and `romegaSq` generates random deviates.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**See Also**

`convert.omegasq.to.f()`, `convert.f.to.omegasq()`, `df()`, `pf()`, `qf()`, `rf()`

**Examples**

```
### Generate 10 random Omega Squared values
romegaSq(10, 66, 3);

### Probability of findings an Omega Squared
### value smaller than .06 if it's 0 in the population
pomegaSq(.06, 66, 3);
```

---

pwr.bootES	<i>Estimate required sample size for accuracy in parameter estimation using bootES</i>
------------	--

---

### Description

This function uses `bootES::bootES()` to compute

### Usage

```
pwr.bootES(data = data, ci.type = "bca", ..., w = 0.1, silent = TRUE)
```

### Arguments

data	The dataset, as you would normally supply to <code>bootES::bootES()</code> ; you will probably have to simulate this.
ci.type	The estimation method; by default, the default of <code>bootES::bootES()</code> is used ('bca'), but this is changed to 'basic' if it encounters problems.
...	Other options for <code>bootES::bootES()</code> (see that help page).
w	The desired 'halfwidth' of the confidence interval.
silent	Whether to provide a lot of information about progress ('FALSE') or not ('TRUE').

### Value

A single numeric value (the sample size).

### References

Kirby, K. N., & Gerlanc, D. (2013). BootES: An R package for bootstrap confidence intervals on effect sizes. *Behavior Research Methods*, 45, 905–927. doi: [10.3758/s1342801303305](https://doi.org/10.3758/s1342801303305)

### Examples

```
### To estimate a mean
x <- rnorm(500, mean=8, sd=3);
pwr.bootES(data.frame(x=x),
            R=500,
            w=.5);

### To estimate a correlation (the 'effect.type' parameter is
### redundant here; with two columns in the data frame, computing
### the confidence interval for the Pearson correlation is the default
### behavior of bootES)
y <- x+rnorm(500, mean=0, sd=5);
cor(x, y);
requiredN <-
  pwr.bootES(data.frame(x=x,
                        y=y),
```

```

        effect.type='r',
        R=500,
        w=.2);
print(requiredN);
### Compare to parametric confidence interval
### based on the computed required sample size
confIntR(r = cor(x, y),
        N = requiredN);
### Width of obtained confidence interval
print(round(diff(as.numeric(confIntR(r = cor(x, y),
        N = requiredN))), 2));

```

---

pwr.confIntProp	<i>Estimate required sample size for accuracy in parameter estimation of a proportion</i>
-----------------	---

---

### Description

This function uses `confIntProp()` to compute the required sample size for estimating a proportion with a given accuracy.

### Usage

```
pwr.confIntProp(prop, conf.level = 0.95, w = 0.1, silent = TRUE)
```

### Arguments

prop	The proportion you expect to find, or a vector of proportions to enable easy sensitivity analyses.
conf.level	The confidence level of the desired confidence interval.
w	The desired 'halfwidth' of the confidence interval.
silent	Whether to provide a lot of information about progress ('FALSE') or not ('TRUE').

### Value

A single numeric value (the sample size).

### Examples

```

### Required sample size to estimate a prevalence of .03 in the
### population with a confidence interval of a maximum half-width of .01
pwr.confIntProp(.03, w=.01);

### Vectorized over prop, so you can easily see how the required sample
### size varies as a function of the proportion
pwr.confIntProp(c(.03, .05, .10), w=.01);

```

---

pwr.confIntR                      *Determine required sample size for a given confidence interval width for Pearson's r*

---

### Description

This function computes how many participants you need if you want to achieve a confidence interval of a given width. This is useful when you do a study and you are interested in how strongly two variables are associated.

### Usage

```
pwr.confIntR(r, w = 0.1, conf.level = 0.95)
```

### Arguments

r	The correlation you expect to find (confidence intervals for a given level of confidence get narrower as the correlation coefficient increases).
w	The required half-width (or margin of error) of the confidence interval.
conf.level	The level of confidence.

### Value

The required sample size, or a vector or matrix of sample sizes if multiple correlation coefficients or required (half-)widths were supplied. The row and column names specify the r and w values to which the sample size in each cell corresponds. The confidence level is set as attribute to the resulting vector or matrix.

### Author(s)

Douglas Bonett (UC Santa Cruz, United States), with minor edits by Murray Moinester (Tel Aviv University, Israel) and Gjalt-Jorn Peters (Open University of the Netherlands, the Netherlands).

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### References

Bonett, D. G., Wright, T. A. (2000). Sample size requirements for estimating Pearson, Kendall and Spearman correlations. *Psychometrika*, 65, 23-28.

Bonett, D. G. (2014). CIcorr.R and sizeCIcorr.R <http://people.ucsc.edu/~dgbonett/psyc181.html>

Moinester, M., & Gottfried, R. (2014). Sample size estimation for correlations with pre-specified confidence interval. *The Quantitative Methods of Psychology*, 10(2), 124-130. <http://www.tqmp.org/RegularArticles/vol10-2/p124/p124.pdf>

Peters, G. J. Y. & Crutzen, R. (forthcoming) An easy and foolproof method for establishing how effective an intervention or behavior change method is: required sample size for accurate parameter estimation in health psychology.

**See Also**[pwr.confIntR](#)**Examples**

```
pwr.confIntR(c(.4, .6, .8), w=c(.1, .2));
```

---

quietRemotesInstall	<i>Quietly update a package from a remote repository</i>
---------------------	--

---

**Description**

Simple wrapper for remotes functions that fail gracefully (well, don't fail at all, just don't do what they're supposed to do) when there's no internet connection).

**Usage**

```
quietRemotesInstall(  
  x,  
  func,  
  unloadNamespace = TRUE,  
  dependencies = FALSE,  
  upgrade = FALSE,  
  quiet = TRUE,  
  errorInvisible = TRUE,  
  ...  
)  
  
quietGitLabUpdate(  
  x,  
  unloadNamespace = TRUE,  
  dependencies = FALSE,  
  upgrade = FALSE,  
  quiet = TRUE,  
  errorInvisible = TRUE,  
  ...  
)
```

**Arguments**

x	The repository name (e.g. "r-packages/ufs")
func	The remotes function to use
unloadNamespace	Whether to first unload the relevant namespace

dependencies, upgrade      Whether to install dependencies or upgrade  
 quiet                      Whether to suppress messages and warnings  
 errorInvisible      Whether to suppress errors  
 ...                      Additional arguments are passed on to the remotes function

**Value**

The result of the call to the remotes function

---

qVec                      *Convenience function to quickly copy-paste a vector*

---

**Description**

Convenience function to quickly copy-paste a vector

**Usage**

```
qVec(x, fn = NULL)
```

```
qVecSum(x)
```

**Arguments**

x                      A string with numbers, separated by arbitrary whitespace.  
 fn                      An optional function to apply to the vector before returning it.

**Value**

The numeric vector or result of calling the function

**Examples**

```
qVec('23 9 11 14 12 20');
```

---

regrInfluential      *Detecting influential cases in regression analyses*

---

### Description

This function combines a number of criteria for determining whether a datapoint is an influential case in a regression analysis. It then sum the criteria to compute an index of influentiality. A list of cases with an index of influentiality of 1 or more is then displayed, after which the regression analysis is repeated without those influential cases. A scattermatrix is also displayed, showing the density curves of each variable, and in the scattermatrix, points that are colored depending on how influential each case is.

### Usage

```
regrInfluential(formula, data, createPlot = TRUE)
```

```
## S3 method for class 'regrInfluential'  
print(x, headingLevel = 3, ...)
```

### Arguments

formula	The formule of the regression analysis.
data	The data to use for the analysis.
createPlot	Whether to create the scattermatrix (requires the GGally package to be installed).
x	Object to print.
headingLevel	The number of hash symbols to prepend to the heading.
...	Additional arguments are passed on to the regr print function.

### Value

A regrInfluential object, which, if printed, shows the influential cases, the regression analyses repeated without those cases, and the scatter matrix.

### Author(s)

Gjalt-Jorn Peters & Marwin Snippe

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### Examples

```
regrInfluential(mpg ~ hp, mtcars);
```



---

repeatStr	<i>Repeat a string a number of times</i>
-----------	--

---

**Description**

Repeat a string a number of times

**Usage**

```
repeatStr(n = 1, str = " ")
```

**Arguments**

n, str	Normally, respectively the frequency with which to repeat the string and the string to repeat; but the order of the inputs can be switched as well.
--------	---

**Value**

A character vector of length 1.

**Examples**

```
### 10 spaces:
repStr(10);

### Three euro symbols:
repStr("\u20ac", 3);
```

---

report	<i>Output report from results</i>
--------	-----------------------------------

---

**Description**

This method can be used to format results in a way that can directly be included in a report or manuscript.

**Usage**

```
report(x, headingLevel = 3, quiet = TRUE, ...)

## Default S3 method:
report(x, headingLevel = 3, quiet = TRUE, ...)
```

**Arguments**

x	The object to show.
headingLevel	The level of the Markdown heading to provide; basically the number of hashes ('#') to prepend to the headings.
quiet	Passed on to <code>knitr::knit()</code> whether it should be chatty (FALSE) or quiet (TRUE).
...	Passed to the specific method; for the default method, this is passed to the print method.

---

safeRequire	<i>Load a package, install if not available</i>
-------------	---

---

**Description**

Load a package, install if not available

**Usage**

```
safeRequire(packageName, mirrorIndex = NULL)
```

**Arguments**

packageName	The package
mirrorIndex	The index of the mirror (1 is used if not specified)

---

scaleDiagnosis	<i>scaleDiagnosis</i>
----------------	-----------------------

---

**Description**

scaleDiagnosis provides a number of diagnostics for a scale (an aggregative measure consisting of several items).

**Usage**

```
scaleDiagnosis(
  data = NULL,
  items = NULL,
  plotSize = 180,
  sizeMultiplier = 1,
  axisLabels = "none",
  scaleReliability.ci = FALSE,
  conf.level = 0.95,
  normalHist = TRUE,
  poly = TRUE,
```

```

    digits = 3,
    headingLevel = 3,
    scaleName = NULL,
    ...
)

## S3 method for class 'scaleDiagnosis'
print(x, digits = x$digits, ...)

scaleDiagnosis_partial(
  x,
  headingLevel = x$input$headingLevel,
  quiet = TRUE,
  echoPartial = FALSE,
  partialFile = NULL,
  ...
)

## S3 method for class 'scaleDiagnosis'
knit_print(
  x,
  headingLevel = x$headingLevel,
  quiet = TRUE,
  echoPartial = FALSE,
  partialFile = NULL,
  ...
)

```

### Arguments

<code>data</code>	A dataframe containing the items in the scale. All variables in this dataframe will be used if items is NULL.
<code>items</code>	If not NULL, this should be a character vector with the names of the variables in the dataframe that represent items in the scale.
<code>plotSize</code>	Size of the final plot in millimeters.
<code>sizeMultiplier</code>	Allows more flexible control over the size of the plot elements
<code>axisLabels</code>	Passed to <code>ggpairs</code> function to set axisLabels.
<code>scaleReliability.ci</code>	TRUE or FALSE: whether to compute confidence intervals for Cronbach's Alpha and Omega (uses bootstrapping function in MBESS, takes a while).
<code>conf.level</code>	Confidence of confidence intervals for reliability estimates (if requested with <code>scaleReliability.ci</code> ).
<code>normalHist</code>	Whether to use the default <code>ggpairs</code> histogram on the diagonal of the scattermatrix, or whether to use the <code>normalHist()</code> version.
<code>poly</code>	Whether to also request the estimates based on the polychoric correlation matrix when calling <code>scaleStructure()</code> .

digits	The number of digits to pass to the print method for the descriptives dataframe.
headingLevel	The level of the heading (number of hash characters to insert before the heading, to be rendered as headings of that level in Markdown).
scaleName	Optionally, a name for the scale to print as heading for the results.
...	Additional arguments for scaleDiagnosis() are passed on to scatterMatrix(), and additional arguments for the print method are passed to the default print method.
x	The object to print.
quiet	Whether to be chatty (FALSE) or quiet (TRUE).
echoPartial	Whether to show the code in the partial (TRUE) or hide it (FALSE).
partialFile	The file with the Rmd partial (if you want to overwrite the default).

### Details

Function to generate an object with several useful statistics and a plot to assess how the elements (usually items) in a scale relate to each other, such as Cronbach's Alpha, omega, the Greatest Lower Bound, a factor analysis, and a correlation matrix.

### Value

An object with the input and several output variables. Most notably:

scaleReliability	The results of scaleReliability.
pca	A Principal Components Analysis
fa	A Factor Analysis
describe	Decriptive statistics about the items
scatterMatrix	A scattermatrix with histograms on the diagonal and correlation coefficients in the upper right half.

### Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### Examples

```
### Note: the 'not run' is simply because running takes a lot of time,
###       but these examples are all safe to run!
## Not run:
### This will prompt the user to select an SPSS file
scaleDiagnosis();

### Generate a datafile to use
exampleData <- data.frame(item1=rnorm(100));
exampleData$item2 <- exampleData$item1+rnorm(100);
```

```

exampleData$item3 <- exampleData$item1+rnorm(100);
exampleData$item4 <- exampleData$item2+rnorm(100);
exampleData$item5 <- exampleData$item2+rnorm(100);

### Use a selection of two variables
scaleDiagnosis(data=exampleData, items=c('item2', 'item4'));

### Use all items
scaleDiagnosis(data=exampleData);

## End(Not run)

```

---

scaleStructure	<i>scaleStructure</i>
----------------	-----------------------

---

## Description

The `scaleStructure` function (which was originally called `scaleReliability`) computes a number of measures to assess scale reliability and internal consistency. Note that to compute omega, the MBESS and/or the psych packages need to be installed, which are suggested packages and therefore should be installed separately (i.e. won't be installed automatically).

## Usage

```

scaleStructure(
  data = NULL,
  items = "all",
  digits = 2,
  ci = TRUE,
  interval.type = "normal-theory",
  conf.level = 0.95,
  silent = FALSE,
  samples = 1000,
  bootstrapSeed = NULL,
  omega.psych = TRUE,
  omega.psych_nfactors = 3,
  omega.psych_flip = TRUE,
  poly = TRUE,
  suppressSuggestedPkgsMsg = FALSE,
  headingLevel = 3
)

## S3 method for class 'scaleStructure'
print(x, digits = x$input$digits, ...)

scaleStructure_partial(
  x,

```

```

    headingLevel = x$input$headingLevel,
    quiet = TRUE,
    echoPartial = FALSE,
    partialFile = NULL,
    ...
  )

## S3 method for class 'scaleStructure'
knit_print(
  x,
  headingLevel = x$input$headingLevel,
  quiet = TRUE,
  echoPartial = FALSE,
  partialFile = NULL,
  ...
)

```

### Arguments

<code>data</code>	A dataframe containing the items in the scale. All variables in this dataframe will be used if <code>items = 'all'</code> . If <code>dat</code> is <code>NULL</code> , a the <code>getData</code> function will be called to show the user a dialog to open a file.
<code>items</code>	If not <code>'all'</code> , this should be a character vector with the names of the variables in the dataframe that represent items in the scale.
<code>digits</code>	Number of digits to use in the presentation of the results.
<code>ci</code>	Whether to compute confidence intervals as well. This requires the suggested MBESS package, which has to be installed separately. If true, the method specified in <code>interval.type</code> is used. When specifying a bootstrapping method, this can take quite a while!
<code>interval.type</code>	Method to use when computing confidence intervals. The list of methods is explained in the help file for <code>ci.reliability</code> in MBESS. Note that when specifying a bootstrapping method, the method will be set to <code>normal-theory</code> for computing the confidence intervals for the ordinal estimates, because these are based on the polychoric correlation matrix, and raw data is required for bootstrapping.
<code>conf.level</code>	The confidence of the confidence intervals.
<code>silent</code>	If computing confidence intervals, the user is warned that it may take a while, unless <code>silent=TRUE</code> .
<code>samples</code>	The number of samples to compute for the bootstrapping of the confidence intervals.
<code>bootstrapSeed</code>	The seed to use for the bootstrapping - setting this seed makes it possible to replicate the exact same intervals, which is useful for publications.
<code>omega.psych</code>	Whether to also compute the interval estimate for omega using the <code>omega</code> function in the <code>psych</code> package. The default point estimate and confidence interval for omega are based on the procedure suggested by Dunn, Baguley & Brunson (2013) using the MBESS function <code>ci.reliability</code> (because it has more options for computing confidence intervals, not always requiring bootstrapping),

whereas the psych package point estimate was suggested in Revelle & Zinbarg (2008). The psych estimate usually (perhaps always) results in higher estimates for omega.

omega.psych_nfactors	The number of factor to use in the factor analysis when computing Omega. The default in <code>psych::omega()</code> is 3; to obtain the same results as in jamovi's "Reliability", set this to 1.
omega.psych_flip	Whether to let psych automatically flip items with negative correlations. The default in <code>psych::omega()</code> is TRUE; to obtain the same results as in jamovi's "Reliability", set this to FALSE.
poly	Whether to compute ordinal measures (if the items have sufficiently few categories).
suppressSuggestedPkgsMsg	Whether to suppress the message about the suggested MBESS and psych packages.
headingLevel	The level of the Markdown heading to provide; basically the number of hashes ('#') to prepend to the headings.
x	The object to print
...	Any additional arguments for the default print function.
quiet	Passed on to <code>knitr::knit()</code> whether it should be chatty (FALSE) or quiet (TRUE).
echoPartial	Whether to show the executed code in the R Markdown partial (TRUE) or not (FALSE).
partialFile	This can be used to specify a custom partial file. The file will have object x available, which is the result of a call to <code>scaleStructure()</code> .

## Details

If you use this function in an academic paper, please cite Peters (2014), where the function is introduced, and/or Crutzen & Peters (2015), where the function is discussed from a broader perspective.

This function is basically a wrapper for functions from the psych and MBESS packages that compute measures of reliability and internal consistency. For backwards compatibility, in addition to `scaleStructure`, `scaleReliability` can also be used to call this function.

## Value

An object with the input and several output variables. Most notably:

input	Input specified when calling the function
intermediate	Intermediate values and objects computed to get to the final results
output	Values of reliability / internal consistency measures, with as most notable elements:
output\$dat	A dataframe with the most important outcomes
output\$omega	Point estimate for omega
output\$glb	Point estimate for the Greatest Lower Bound

```

output$alpha    Point estimate for Cronbach's alpha
output$coefficentH
                Coefficient H
output$omega.ci
                Confidence interval for omega
output$alpha.ci
                Confidence interval for Cronbach's alpha

```

### Author(s)

Gjalt-Jorn Peters and Daniel McNeish (University of North Carolina, Chapel Hill, US).

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### References

- Crutzen, R., & Peters, G.-J. Y. (2015). Scale quality: alpha is an inadequate estimate and factor-analytic evidence is needed first of all. *Health Psychology Review*. doi: [10.1080/17437199.2015.1124240](https://doi.org/10.1080/17437199.2015.1124240)
- Dunn, T. J., Baguley, T., & Brunnsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology*, 105(3), 399-412. doi: [10.1111/bjop.12046](https://doi.org/10.1111/bjop.12046)
- Eisinga, R., Grotenhuis, M. Te, & Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *International Journal of Public Health*, 58(4), 637-42. doi: [10.1007/s0003801204163](https://doi.org/10.1007/s0003801204163)
- Gadermann, A. M., Guhn, M., Zumbo, B. D., & Columbia, B. (2012). Estimating ordinal reliability for Likert-type and ordinal item response data: A conceptual, empirical, and practical guide. *Practical Assessment, Research & Evaluation*, 17(3), 1-12. doi: [10.7275/n560j767](https://doi.org/10.7275/n560j767)
- Peters, G.-J. Y. (2014). The alpha and the omega of scale reliability and validity: why and how to abandon Cronbach's alpha and the route towards more comprehensive assessment of scale quality. *European Health Psychologist*, 16(2), 56-69. doi: [10.31234/osf.io/h47fv](https://doi.org/10.31234/osf.io/h47fv)
- Revelle, W., & Zinbarg, R. E. (2009). Coefficients Alpha, Beta, Omega, and the glb: Comments on Sijtsma. *Psychometrika*, 74(1), 145-154. doi: [10.1007/s113360089102z](https://doi.org/10.1007/s113360089102z)
- Sijtsma, K. (2009). On the Use, the Misuse, and the Very Limited Usefulness of Cronbach's Alpha. *Psychometrika*, 74(1), 107-120. doi: [10.1007/s1133600891010](https://doi.org/10.1007/s1133600891010)
- Zinbarg, R. E., Revelle, W., Yovel, I., & Li, W. (2005). Cronbach's alpha, Revelle's beta and McDonald's omega H: Their relations with each other and two alternative conceptualizations of reliability. *Psychometrika*, 70(1), 123-133. doi: [10.1007/s1133600309747](https://doi.org/10.1007/s1133600309747)

### See Also

[psych::omega\(\)](#), [psych::alpha\(\)](#), and [MBESS::ci.reliability\(\)](#).

### Examples

```

## Not run:
### (These examples take a lot of time, so they are not run

```



```
### during testing.)

### This will prompt the user to select an SPSS file
scaleStructure();

### Load data from simulated dataset testRetestSimData (which
### satisfies essential tau-equivalence).
data(testRetestSimData);

### Select some items in the first measurement
exampleData <- testRetestSimData[2:6];

### Use all items (don't order confidence intervals to save time
### during automated testing of the example)
scaleStructure(dat=exampleData, ci=FALSE);

### Use a selection of three variables (without confidence
### intervals to save time
scaleStructure(dat=exampleData, items=c('t0_item2', 't0_item3', 't0_item4'),
             ci=FALSE);

### Make the items resemble an ordered categorical (ordinal) scale
ordinalExampleData <- data.frame(apply(exampleData, 2, cut,
                                     breaks=5, ordered_result=TRUE,
                                     labels=as.character(1:5)));

### Now we also get estimates assuming the ordinal measurement level
scaleStructure(ordinalExampleData, ci=FALSE);

## End(Not run)
```

---

scatterMatrix

*scatterMatrix*

---

## Description

scatterMatrix produces a matrix with jittered scatterplots, histograms, and correlation coefficients.

## Usage

```
scatterMatrix(
  dat,
  items = NULL,
  itemLabels = NULL,
  plotSize = 180,
  sizeMultiplier = 1,
  pointSize = 1,
  axisLabels = "none",
```

```

    normalHist = TRUE,
    progress = NULL,
    theme = ggplot2::theme_minimal(),
    hideGrid = TRUE,
    conf.level = 0.95,
    ...
)

## S3 method for class 'scatterMatrix'
print(x, ...)

```

### Arguments

<code>dat</code>	A dataframe containing the items in the scale. All variables in this dataframe will be used if <code>items</code> is <code>NULL</code> .
<code>items</code>	If not <code>NULL</code> , this should be a character vector with the names of the variables in the dataframe that represent items in the scale.
<code>itemLabels</code>	Optionally, labels to use for the items (optionally, named, with the names corresponding to the <code>items</code> ; otherwise, the order of the labels has to match the order of the items)
<code>plotSize</code>	Size of the final plot in millimeters.
<code>sizeMultiplier</code>	Allows more flexible control over the size of the plot elements
<code>pointSize</code>	Size of the points in the scatterplots
<code>axisLabels</code>	Passed to <code>ggpairs</code> function to set <code>axisLabels</code> .
<code>normalHist</code>	Whether to use the default <code>ggpairs</code> histogram on the diagonal of the scattermatrix, or whether to use the <code>normalHist()</code> version.
<code>progress</code>	Whether to show a progress bar; set to <code>FALSE</code> to disable. See <code>GGally::ggpairs()</code> help for more information.
<code>theme</code>	The <code>ggplot2</code> theme to use.
<code>hideGrid</code>	Whether to hide the gridlines in the plot.
<code>conf.level</code>	The confidence level of confidence intervals
<code>...</code>	Additional arguments for <code>scatterMatrix()</code> are passed on to <code>normalHist()</code> , and additional arguments for the <code>print</code> method are passed on to the default <code>print</code> method.
<code>x</code>	The object to print.

### Value

An object with the input and several output variables. Most notably:

```
output$scatterMatrix
```

A scattermatrix with histograms on the diagonal and correlation coefficients in the upper right half.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)**Examples**

```

### Note: the 'not run' is simply because running takes a lot of time,
###       but these examples are all safe to run!
## Not run:

### Generate a datafile to use
exampleData <- data.frame(item1=rnorm(100));
exampleData$item2 <- exampleData$item1+rnorm(100);
exampleData$item3 <- exampleData$item1+rnorm(100);
exampleData$item4 <- exampleData$item2+rnorm(100);
exampleData$item5 <- exampleData$item2+rnorm(100);

### Use all items
scatterMatrix(dat=exampleData);

## End(Not run)

```

---

```
setCaptionNumberingKnitrHook
```

*Set a knitr hook for caption numbering*

---

**Description**

Set a knitr hook to automatically number captions for, e.g., figures and tables. `setCaptionNumberingKnitrHook()` is the general purpose function; you normally use `setFigCapNumbering()` or `setTabCapNumbering()`.

**Usage**

```

setCaptionNumberingKnitrHook(
  captionName = "fig.cap",
  prefix = "Figure %s: ",
  suffix = "",
  optionName = paste0("setCaptionNumbering_", captionName),
  resetCounterTo = 1
)

setFigCapNumbering(
  captionName = "fig.cap",
  prefix = "Figure %s: ",
  suffix = "",
  optionName = paste0("setCaptionNumbering_", captionName),

```

```

    resetCounterTo = 1
)

setTabCapNumbering(
    captionName = "tab.cap",
    prefix = "Table %s: ",
    suffix = "",
    optionName = paste0("setCaptionNumbering_", captionName),
    resetCounterTo = 1
)

```

### Arguments

captionName      The name of the caption; for example, fig.cap or tab.cap.

prefix, suffix    The prefix and suffix; any occurrences of `\%`s will be replaced by the number.

optionName        The name to use for the option that keeps track of the numbering.

resetCounterTo   Whether to reset the counter (as stored in the options), and if so, to what value (set to FALSE to prevent resetting).

### Value

NULL, invisibly.

### Examples

```

### To start automatically numbering figure captions
setFigCapNumbering();

### To start automatically numbering table captions
setTabCapNumbering();

```

---

sharedSubString	<i>sharedSubString</i>
-----------------	------------------------

---

### Description

A function to find the longest shared substring in a character vector.

### Usage

```
sharedSubString(x, y = NULL)
```

### Arguments

x                    The character vector to process.

y                    Optionally, two single values can be specified. This is probably not useful to end users, but it's used by the function when it calls itself.

**Value**

A vector of length one with either the longest substring that occurs in all values of the character vector, or NA if no overlap can be found.

**Author(s)**

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

**Examples**

```
sharedSubString(c("t0_responseTime", "t1_responseTime", "t2_responseTime"));  
### Returns "_responseTime"
```

---

spearmanBrown	<i>Spearman-Brown formula</i>
---------------	-------------------------------

---

**Description**

Spearman-Brown formula

**Usage**

```
spearmanBrown(nrOfItems, itemReliability)
```

```
spearmanBrown_reversed(nrOfItems, scaleReliability)
```

```
spearmanBrown_requiredLength(scaleReliability, itemReliability)
```

**Arguments**

`nrOfItems` Number of items (or 'subtests') in the scale (or 'test').

`itemReliability` The reliability of one item (or 'subtest').

`scaleReliability` The reliability of the scale (or, desired reliability of the scale).

**Value**

For `spearmanBrown`, the predicted scale reliability; for `spearmanBrown_requiredLength`, the number of items required to achieve the desired scale reliability; and for `spearmanBrown_reversed`, the reliability of one item.

**Examples**

```
spearmanBrown(10, .4);
spearmanBrown_reversed(10, .87);
spearmanBrown_requiredLength(.87, .4);
```

---

strToFilename	<i>Convert a string to a safe filename</i>
---------------	--

---

**Description**

Convert a string to a safe filename

**Usage**

```
strToFilename(str, ext = NULL)
```

**Arguments**

str	The string to convert.
ext	Optionally, an extension to append.

**Value**

The string, processed to remove potentially problematic characters.

**Examples**

```
strToFilename("this contains: illegal characters, spaces, et cetera.");
```

---

suspectParticipants	<i>Selects suspect participants from a carelessObject</i>
---------------------	---

---

**Description**

This function is a wrapper for the [carelessObject\(\)](#) function, which wraps a number of functions from the `careless` package. Normally, you'd probably call `carelessReport` which calls this function to generate a report of suspect participants.

**Usage**

```
suspectParticipants(
  carelessObject,
  nFlags = 1,
  digits = 2,
  missingSymbol = "Missing"
)
```

**Arguments**

**carelessObject** The result of the call to `carelessObject()`.  
**nFlags** The number of flags required to be considered suspect.  
**digits** The number of digits to round to.  
**missingSymbol** How to represent missing values.

**Value**

A logical vector.

**Examples**

```
suspectParticipants(carelessObject(mtcars),
                   nFlags = 2);
```

---

testRetestSimData	<i>testRetestSimData is a simulated dataframe used to demonstrate the testRetestAlpha coefficient function.</i>
-------------------	---

---

**Description**

This dataset contains the true scores of 250 participants on some variable, and 10 items of a scale administered twice (at t0 and at t1).

**Format**

A data frame with 250 observations on the following 21 variables.

**trueScore** The true scores  
**t0\_item1** Score on item 1 at test  
**t0\_item2** Score on item 2 at test  
**t0\_item3** Score on item 3 at test  
**t0\_item4** Score on item 4 at test  
**t0\_item5** Score on item 5 at test  
**t0\_item6** Score on item 6 at test  
**t0\_item7** Score on item 7 at test  
**t0\_item8** Score on item 8 at test  
**t0\_item9** Score on item 9 at test  
**t0\_item10** Score on item 10 at test  
**t1\_item1** Score on item 1 at retest  
**t1\_item2** Score on item 2 at retest  
**t1\_item3** Score on item 3 at retest

**t1\_item4** Score on item 4 at retest  
**t1\_item5** Score on item 5 at retest  
**t1\_item6** Score on item 6 at retest  
**t1\_item7** Score on item 7 at retest  
**t1\_item8** Score on item 8 at retest  
**t1\_item9** Score on item 9 at retest  
**t1\_item10** Score on item 10 at retest

### Details

This dataset was generated with the code in the `reliabilityTest.r` test script.

### Author(s)

Gjalt-Jorn Peters

Maintainer: Gjalt-Jorn Peters [gjalt-jorn@userfriendlyscience.com](mailto:gjalt-jorn@userfriendlyscience.com)

### Examples

```
data(testRetestSimData);
head(testRetestSimData);
hist(testRetestSimData$t0_item1);
cor(testRetestSimData);
```

---

vecTxt

*Easily parse a vector into a character value*

---

### Description

`vecTxtQ`, `vecTxtB`, and `vecTxtM` and are convenience functions with default quotes that can be useful when working in R Markdown documents.

### Usage

```
vecTxt(  
  vector,  
  delimiter = ", ",  
  useQuote = "",  
  firstDelimiter = NULL,  
  lastDelimiter = " & ",  
  firstElements = 0,  
  lastElements = 1,  
  lastHasPrecedence = TRUE  
)
```



```
vecTxtQ(vector, useQuote = "'", ...)
```

```
vecTxtB(vector, useQuote = "`", ...)
```

```
vecTxtM(vector, useQuote = "$", ...)
```

### Arguments

**vector**            The vector to process.

**delimiter, firstDelimiter, lastDelimiter**  
The delimiters to use for respectively the middle, first `firstElements`, and last `lastElements` elements.

**useQuote**        This character string is pre- and appended to all elements; so use this to quote all elements (`useQuote=""`), doublequote all elements (`useQuote=""`), or anything else (e.g. `useQuote='|'`). The only difference between `vecTxt` and `vecTxtQ` is that the latter by default quotes the elements.

**firstElements, lastElements**  
The number of elements for which to use the first respective last delimiters

**lastHasPrecedence**  
If the vector is very short, it's possible that the sum of `firstElements` and `lastElements` is larger than the vector length. In that case, downwardly adjust the number of elements to separate with the first delimiter (TRUE) or the number of elements to separate with the last delimiter (FALSE)?

**...**            Any addition arguments to `vecTxtQ` are passed on to `vecTxt`.

### Value

A character vector of length 1.

### Examples

```
vecTxtQ(names(mtcars));
```

---

```
zotero_construct_export_call
```

*Construct the URL for a Zotero export call*

---

### Description

This function is just a convenience function to create a simple URL to download references from a public Zotero group. See [https://www.zotero.org/support/dev/web\\_api/v3/start](https://www.zotero.org/support/dev/web_api/v3/start) for details.

**Usage**

```
zotero_construct_export_call(  
  group,  
  sort = "dateAdded",  
  direction = "asc",  
  format = "bibtex",  
  start = 0,  
  limit = 100  
)
```

**Arguments**

group	The group ID
sort	On which field to sort
direction	The direction to sort in
format	The format to export
start	The index of the first record to return
limit	The number of records to return

**Value**

The URL in a character vector.

**Examples**

```
zotero_construct_export_call(2425237);
```

---

zotero\_download\_and\_export\_items

*Download and save all items in a public Zotero group*

---

**Description**

Download and save all items in a public Zotero group

**Usage**

```
zotero_download_and_export_items(  
  group,  
  file,  
  format = "bibtex",  
  showKeys = TRUE  
)
```

**Arguments**

group	The group ID
file	The filename to write to
format	The format to export
showKeys	Whether to show the keys

**Value**

The bibliography as a character vector

**Examples**

```
## Not run:
tmpFile <- tempfile(fileext=".bib");
zotero_download_and_export_items(
  2425237,
  tmpFile
);
writtenBibliography <- readLines(tmpFile);
writtenBibliography[1:7];

## End(Not run)
```

---

zotero\_get\_all\_items *Get all items in a public Zotero group*

---

**Description**

Get all items in a public Zotero group

**Usage**

```
zotero_get_all_items(group, format = "bibtex")
```

**Arguments**

group	The group ID
format	The format to export

**Value**

A character vector

**Examples**

```
zotero_get_all_items(2425237);
```

---

`zotero_nr_of_items`      *Get number of items in a public Zotero group*

---

**Description**

Get number of items in a public Zotero group

**Usage**

```
zotero_nr_of_items(group)
```

**Arguments**

`group`                  The group ID

**Value**

The number of items as a numeric vector.

**Examples**

```
zotero_nr_of_items(2425237);
```

---

`%IN%`                      *Case insensitive version of %in%*

---

**Description**

This is simply 'in', but applies `base::toupper()` to both arguments, first.

**Usage**

```
find %IN% table
```

**Arguments**

`find`                      The element(s) to look up in the vector or matrix.  
`table`                    The vector or matrix in which to look up the element(s).

**Value**

A logical vector.

**Examples**

```
letters[1:4] %IN% LETTERS
```

# Index

- \* **bivar**
  - computeStatistic\_t, 28
  - confIntOmegaSq, 30
  - cramersV, 40
- \* **character**
  - escapeRegex, 58
  - sharedSubString, 124
- \* **datasets**
  - opts, 104
  - testRetestSimData, 127
- \* **data**
  - bfi-data, 15
- \* **file**
  - getData, 69
- \* **graphs**
  - ggProportionPlot, 75
- \* **hplot**
  - associationsDiamondPlot, 10
  - biAxisDiamondPlot, 15
  - diamondCoordinates, 47
  - diamondPlot, 51
  - duoComparisonDiamondPlot, 54
  - factorLoadingDiamondCIplot, 62
  - factorLoadingHeatmap, 63
  - ggBoxplot, 72
  - ggEasyBar, 73
  - ggProportionPlot, 75
  - ggqq, 79
  - meansDiamondPlot, 94
  - meanSDtoDiamondPlot, 97
- \* **htest**
  - confIntProp, 32
  - confIntR, 33
  - pwr.confIntR, 109
- \* **manip**
  - escapeRegex, 58
- \* **programming**
  - escapeRegex, 58
- \* **univariate**
  - descr, 45
  - iqrOutlier, 84
- \* **univar**
  - associationMatrix, 7
  - cohensdCI, 25
  - confIntProp, 32
  - getData, 69
  - pomegaSq, 105
  - scaleDiagnosis, 114
  - scaleStructure, 117
  - scatterMatrix, 121
- \* **utilities**
  - areColors, 5
  - associationMatrix, 7
  - computeStatistic\_t, 28
  - convert, 36
  - convert.cer.to.d, 37
  - dataShape, 41
  - findShortestInterval, 66
  - getData, 69
  - knitFig, 90
  - multiResponse, 99
  - multiVarFreq, 101
  - normalHist, 102
  - scaleDiagnosis, 114
  - scaleStructure, 117
  - scatterMatrix, 121
- \* **utils**
  - extractVarName, 60
  - %IN%, 132
- A\_VarghaDelaney, 14
- aipedjmv, 4
- aiperjmv, 4
- areColors, 5
- arr, 6
- as.data.frame, 100
- as.data.frame(), 47
- as.data.frame.descr(descr), 45
- associationMatrix, 7

- associationMatrixESDefaults  
(computeStatistic\_t), 28
- associationMatrixStatDefaults  
(computeStatistic\_t), 28
- associationsDiamondPlot, 10
- associationsDiamondPlot(), 17, 57
- associationsToDiamondPlotDf  
(associationsDiamondPlot), 10
- attenuate.d, 12
- attenuate.r, 13
- base::cat(), 90
- base::sprintf(), 83
- base::toupper(), 132
- behaviorchange::CIBER(), 15, 17, 58
- behaviorchange::nnc(), 37, 39
- bfi (bfi-data), 15
- bfi-data, 15
- biAxisDiamondPlot, 15
- biDimColors, 18
- binom.test(), 32, 77
- bootES::bootES(), 107
- carelessObject, 18
- carelessObject(), 126, 127
- carelessReport, 19
- cat, 21, 90
- cat(), 89, 90
- cat0, 20
- checkPkgs, 21
- CIM, 22
- CIM\_partial (CIM), 22
- cohensdCI, 25
- cohensDdistribution (cohensdCI), 25
- col2rgb(), 23, 49, 62, 64
- colnames(), 33
- colorRamp(), 23, 49, 62, 64
- computeEffectSize\_d  
(computeStatistic\_t), 28
- computeEffectSize\_etasq  
(computeStatistic\_t), 28
- computeEffectSize\_omegasq  
(computeStatistic\_t), 28
- computeEffectSize\_r  
(computeStatistic\_t), 28
- computeEffectSize\_v  
(computeStatistic\_t), 28
- computeStatistic\_chisq  
(computeStatistic\_t), 28
- computeStatistic\_f  
(computeStatistic\_t), 28
- computeStatistic\_r  
(computeStatistic\_t), 28
- computeStatistic\_t, 28
- confIntD (cohensdCI), 25
- confintdjmv, 30
- confIntOmegaSq, 30
- confIntProp, 32
- confIntProp(), 77, 108
- confIntR, 33
- confIntR(), 34
- confintrjmv, 34
- confIntSD, 35
- confIntV (cramersV), 40
- convert, 36
- convert.cer.to.d, 37
- convert.d.to.eer (convert.cer.to.d), 37
- convert.d.to.nnc (convert.cer.to.d), 37
- convert.d.to.t(), 26, 27
- convert.d.to.U3, 39
- convert.eer.to.d (convert.cer.to.d), 37
- convert.f.to.omegasq(), 106
- convert.ncf.to.omegasq(), 30, 31, 106
- convert.omegasq.to.f(), 106
- convert.t.to.d(), 26, 27
- convertToNumeric, 39
- cramersV, 40
- dataShape, 41
- dCohensd (cohensdCI), 25
- dd (cohensdCI), 25
- descr, 45
- descriptives (descr), 45
- df(), 106
- diamondCoordinates, 47
- diamondPlot, 51
- diamondPlot(), 11, 12, 16, 47, 50, 57, 58, 62, 63, 65, 95, 98
- digest::digest(), 90
- diptest::dip.test(), 47
- disattenuate.d, 53
- disattenuate.r, 54
- dnorm, 79
- domegasq (pomegasq), 105
- dt(), 27
- duoComparisonDiamondPlot, 54
- escapeBS (escapeRegex), 58

- escapeRegex, 58
- exportToHTML, 59
- extractVarName, 60
  
- fa\_failsafe, 65
- faConfInt, 61
- factorLoadingDiamondCIplot, 62
- factorLoadingDiamondCIplot(), 47, 50–52, 95, 98
- factorLoadingHeatmap, 63
- findShortestInterval, 66
- formatCI, 67
- formatCI(), 68, 69, 104
- formatPvalue, 68
- formatPvalue(), 67, 69, 104
- formatR, 69
- formatR(), 67, 68, 104
  
- geom\_bar(), 75
- geom\_boxplot, 72, 73
- geom\_jitter(), 49, 50
- geom\_polygon(), 49, 50
- geom\_ridgeline(), 75
- get (opts), 104
- getDat (getData), 69
- getData, 69, 118
- GGally::ggpairs(), 122
- ggBarChart, 71
- ggBoxplot, 72
- ggDiamondLayer (diamondCoordinates), 47
- ggDiamondLayer(), 11, 12, 51, 52, 62–65, 95, 98
- ggEasyBar, 73
- ggEasyPlots (ggEasyBar), 73
- ggEasyRidge (ggEasyBar), 73
- ggplot, 72, 73, 80, 90
- ggplot(), 11, 16, 50, 52, 74, 95, 98
- ggplot2(), 77
- ggplot2::geom\_bar(), 71, 72
- ggplot2::ggplot(), 24, 52, 57, 63, 64, 71, 85, 103
- ggplot2::ggsave(), 81
- ggProportionPlot, 32, 75
- ggqq, 79
- ggSave, 80
- ggSave(), 89
- grep, 59
- grid.draw.ggProportionPlot (ggProportionPlot), 75
  
- gtable(), 57
- gtable::gtable(), 17
  
- heading, 81
  
- ifelseObj, 82
- insertFigureCaption, 83
- insertNumberedCaption (insertFigureCaption), 83
- insertTableCaption (insertFigureCaption), 83
  
- IQR, 84
- iqrOutlier, 84
- irpplot, 85
- is.even (is.odd), 86
- is.nr, 86
- is.odd, 86
- isTrue, 87
  
- kblXtra, 88
- knit, 90, 91
- knit\_expand, 90, 91
- knit\_print.CIM (CIM), 22
- knit\_print.scaleDiagnosis (scaleDiagnosis), 114
- knit\_print.scaleStructure (scaleStructure), 117
- knitAndSave, 89
- knitFig, 90
- knitFig(), 89
- knitr::asis\_output(), 90
- knitr::kable(), 88
- knitr::knit(), 114, 119
  
- library(), 21
- linetype(), 77
  
- makeScales, 91
- massConvertToNumeric, 92
- MBESS::ci.reliability(), 120
- meanConfInt, 93
- meansComparisonDiamondPlot (duoComparisonDiamondPlot), 54
- meansDiamondPlot, 94
- meansDiamondPlot(), 15, 17, 47, 50–52, 58, 63, 65, 98
- meansDiamondPlotjmv, 96
- meanSDtoDiamondPlot, 97
- meanSDtoDiamondPlot(), 47, 50–52, 63, 65, 95

- multiResponse, 99
- multiResponsejmv, 100
- multiVarFreq, 101
  
- normalHist, 102
- normalHist(), 115, 122
- normalityAssessment, 79
- normalityAssessment (dataShape), 41
- noZero, 68, 104
- noZero(), 67–69
  
- opts, 104
  
- pander.associationMatrix
  - (associationMatrix), 7
- pander.dataShape (dataShape), 41
- pander.descr (descr), 45
- pander.normalityAssessment (dataShape), 41
- pander::pander(), 8
- pbeta(), 32
- pCohensd (cohensdCI), 25
- pd (cohensdCI), 25
- pdExtreme (cohensdCI), 25
- pdInterval (cohensdCI), 25
- pdMild (cohensdCI), 25
- pf(), 106
- pnorm(), 39
- pomegaSq, 105
- print(), 8
- print.associationMatrix
  - (associationMatrix), 7
- print.confIntOmegaSq (confIntOmegaSq), 30
- print.confIntV (cramersV), 40
- print.CramersV (cramersV), 40
- print.dataShape (dataShape), 41
- print.descr (descr), 45
- print.ggProportionPlot
  - (ggProportionPlot), 75
- print.meanConfInt (meanConfInt), 93
- print.normalHist (normalHist), 102
- print.normalityAssessment (dataShape), 41
- print.regrInfluential
  - (regrInfluential), 112
- print.scaleDiagnosis (scaleDiagnosis), 114
- print.scaleStructure (scaleStructure), 117
- print.scatterMatrix (scatterMatrix), 121
- print.ufsARR (arr), 6
- psych::alpha(), 120
- psych::describe(), 47
- psych::fa(), 23, 61–65
- psych::omega(), 119, 120
- psych::psych, 47, 62, 64
- psych::psych-package, 61
- pt(), 27
- pwr.bootES, 107
- pwr.cohensdCI (cohensdCI), 25
- pwr.confIntd (cohensdCI), 25
- pwr.confIntProp, 108
- pwr.confIntR, 109, 110
  
- qCohensd (cohensdCI), 25
- qd (cohensdCI), 25
- qf(), 106
- qnorm, 79
- qomegaSq (pomegaSq), 105
- qt(), 26, 27
- quantile, 46
- quietGitLabUpdate
  - (quietRemotesInstall), 110
- quietRemotesInstall, 110
- qVec, 111
- qVecSum (qVec), 111
  
- rawDataDiamondLayer
  - (diamondCoordinates), 47
- rCohensd (cohensdCI), 25
- rd (cohensdCI), 25
- regrInfluential, 112
- rep(), 80
- repeatStr, 113
- report, 113
- repStr (repeatStr), 113
- require(), 21
- reset (opts), 104
- rf(), 106
- romegaSq (pomegaSq), 105
- rownames(), 33
- rt(), 27
  
- safeRequire, 114
- samplingDistribution (dataShape), 41
- scaleDiagnosis, 114



scaleDiagnosis\_partial  
    (scaleDiagnosis), 114  
scaleReliability(scaleStructure), 117  
scaleStructure, 117  
scaleStructure(), 115  
scaleStructure\_partial  
    (scaleStructure), 117  
scaleStructurePartial(scaleStructure),  
    117  
scatterMatrix, 121  
scatterMatrix(), 116  
set(opts), 104  
setCaptionNumberingKnitrHook, 123  
setFigCapNumbering  
    (setCaptionNumberingKnitrHook),  
    123  
setFigCapNumbering(), 83  
setTabCapNumbering  
    (setCaptionNumberingKnitrHook),  
    123  
setTabCapNumbering(), 83  
sharedSubString, 124  
spearmanBrown, 125  
spearmanBrown\_requiredLength  
    (spearmanBrown), 125  
spearmanBrown\_reversed(spearmanBrown),  
    125  
stats::wilcox.test(), 14  
strToFilename, 126  
summary, 47  
suspectParticipants, 126  
Sys.time, 90  
  
table(), 101  
testRetestSimData, 127  
  
uniDimColors(biDimColors), 18  
  
varsToDiamondPlotDf  
    (diamondCoordinates), 47  
vecTxt, 128  
vecTxtB(vecTxt), 128  
vecTxtM(vecTxt), 128  
vecTxtQ(vecTxt), 128  
viridis(), 62, 64  
  
zotero\_construct\_export\_call, 129  
zotero\_download\_and\_export\_items, 130  
zotero\_get\_all\_items, 131  
zotero\_nr\_of\_items, 132