Package 'Scale'

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Type Package

Title Likert Type Questionnaire Item Analysis

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Description Provides the Scale class and corresponding functions, in order to facilitate data input for scale construction. Reverse items and alternative orders of administration are dealt with by the program. Computes reliability statistics, confirmatory, single factor loadings. It suggests item deletions and produces basic text output in English, for incorporation in reports. Returns list objects of all relevant functions from other packages (see Depends).

License GPL-2

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`Scale-package` *Likert Type Questionnaire Item Analysis*

Description

Provides the ScaleData class and corresponding functions, in order to facilitate data input for scale construction. Reverse items and alternative orders of administration are dealt with by the program. Computes reliability statistics, and confirmatory single factor loadings. It suggests item deletions and produces basic text output in English. Returns list objects of all relevant functions from other packages (see Depends).

Details

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Author(s)

Nikolaos Giallousis

Maintainer: Nikolaos Giallousis <psierevn@gmail.com>

See Also

`psych`

Examples

```
data(Depression98)

depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
```

```
                            12,5,10,13,2,17,11,9)),
                          orders_id=c(
                            rep(1, 49),
                            rep(2, 49)),
                          reverse=c(3,4,13,14,18,20),
                          col_names= paste('q', 1:20, sep=''))

depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)

ReportTable(depressionRel)
```

ChooseBest *Select Items from Item Analysis.*

Description

Takes an ItemAnalysis object, and returns the column names, i.e. the item labels of those items that load the highest on the single factor. Defaults to 5 items.

Usage

```
ChooseBest(it, n=5)
```

Arguments

it	An ItemAnalysis object, produced by the ItemAnalysis() function.
n	The number of items to select. Asking for more items than available leads to an error.

Value

A character vector, with the labels of the items, as defined in ScaleData object.

Author(s)

Nikolaos Giallousis

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                          orders=list(
                            c(16,19,11,9,1,17,5,18,4,8,2,12,
                              20,10,14,6,3,13,15,7),
                            c(1,18,4,15,7,8,3,14,20,6,19,16,
                              12,5,10,13,2,17,11,9)),
```

```
                          orders_id=c(
                            rep(1, 49),
                            rep(2, 49)),
                          reverse=c(3,4,13,14,18,20),
                          col_names= paste('q', 1:20, sep=''))
depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)

depressionItems <- ChooseBest(depressionRel)
```

`Depression98` *Depression Data Set*

Description

A data frame with 98 observations on 20 depression related items.

Usage

```
data("Depression98")
```

Examples

```
data(Depression98)
```

`GetScores` *Extract Participant Scores from Item Analysis Object*

Description

Takes an output of the `ItemAnalysis()` function, and extracts the participants scores, as calculated in`ItemAnalysis()`. If asked to, it writes the scores in a column in a `.csv` file.

Usage

```
GetScores(it, write_file=FALSE, sep=";", scale_name="My_Scale")
```

Arguments

`it`	An `ItemAnalysis` object, created by the `ItemAnalysis()` function.
`write_file`	logical. Should the function write a `.csv` file?
`sep`	If a file is to be written, `sep` will be the delimiter. Defaults to ";".
`scale_name`	character. Name for use in the `data.frame` as well as in the written file.

Details

If you need another type of scores, you should specify it in the `ItemAnalysis()` function, with the `score_type` argument.

Default scale name is "My_Scale". Thus, default output file name is "My_Scale.csv".

Value

A `data.frame` with the scores of the participants.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                             12,5,10,13,2,17,11,9)),
                         orders_id=c(
                           rep(1, 49),
                           rep(2, 49)),
                         reverse=c(3,4,13,14,18,20),
                         col_names= paste('q', 1:20, sep=''))
depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)

depressionScores <- GetScores(depressionRel)
```

`ItemAnalysis` *Reliability and Validity Analysis*

Description

Performs an item analysis based on item-scale correlations, and then conducts factor analysis with one factor. Reports Cronbach alpha and single factor loadings, while it returns the original analyses from the psych package.

Usage

```
ItemAnalysis(prep, method="spearman", fm="gls",
nfactors=1, rcut= 0.3, score_type="z", exclude=c())
```

Arguments

prep	A ScaleData object pre-processed with PreProc.
nfactors	Number of factors to be extracted in validity analysis.
rcut	Lower bound for items' correlation to scale.
score_type	Type of standard scores to calculate ("z", "t", or "sten".)
method	Method to calculate the correlation matrix. Options are: "spearman" or "polychoric".
fm	Method for factor xtraction in the validity analysis.
exclude	Items to exclude from the analysis. Indices in the original order.

Details

This function is no more than a wrap-up for psych package alpha and fa functions. Use ?psych::alpha and psych::fa for details.

Available method for correlations are "spearman" and "polychoric". Available methods for factor extraction are "minres", "wls", "gls", "pa", "ml", "minchi".

Defining number of factors is included for sake of completeness. The intended use of the function is a quick and error-proof validity measure, and not factor model fitting. Adjusting the number of factors can only serve to see if there is a better model fit with more than one factor. Scores will be calculated for the first factor only. Of course if you need to use this function as a wrapper for psych::fa, you can always extract the object with YOUROBJECT$valid$model.

Default scoring is the sum of the standardized values times the first factor loadings. T-scores translate these to have a mean of 50 and an SD of 10, and STen scores, a mean of 5.5 and an SD of 2.

Value

A list of three objects. data is the dataset, passed on for other computations, rely is the output of the reliability analysis, and valid the output of the factor analysis:

data	The dataset used.
items	The item statements. If not provided value is NULL.
rely	A list of the following elements:
..alpha	Output of the psych::alpha function.
..k	Number of items
..title	Name of analysed object.
..suggest	List of 2: low_cor Items with low correlation to the rest of the scale, and a_drop Items whose deletion may improve reliability.
valid	A list of the following elements:
..model	Output of the psych::fa function
..method	character. The factor extraction method.
..loadings	numeric. The factor loadings
..kmo	list. KMO sampling adequacy statistics.
..bartlett	list. Bartlett's test of sphericity.
..scores	numeric. Factor scores (Standardized, see Details.)

Author(s)

Nikolaos Giallousis, psierevn@gmail.com.

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                             12,5,10,13,2,17,11,9)),
                         orders_id=c(
                           rep(1, 49),
                           rep(2, 49)),
                         reverse=c(3,4,13,14,18,20),
                         col_names= paste('q', 1:20, sep=''))
depressionScale

depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)
depressionRel

depressionRel <- ItemAnalysis(depressionPre, exclude=c(1, 3, 15, 13))
depressionRel
```

`PreProc` *PreProc Prepare Scale Data for Analysis*

Description

Organizes data according to the information given in the ScaleData object. It reorders the items given in alternate orderings to participants, reverses items that need to be reversed, assigns the desired labesl to items and returns a structured object appropriate for the `ItemAnalysis()` function.

Usage

```
PreProc(sc)
```

Arguments

`sc`	`ScaleData` object, produced by the `Scale` function.

Value

`data`	A reversed and reordered - as needed - data.frame.
`items`	If an `items` vector is provided (see `ScaleData`), a character vector with the item statements.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

See Also

ScaleData

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                             12,5,10,13,2,17,11,9)),
                         orders_id=c(
                           rep(1, 49),
                           rep(2, 49)),
                         reverse=c(3,4,13,14,18,20),
                         col_names= paste('q', 1:20, sep=''))
depressionPre <- PreProc(depressionScale)
```

---

print.ItemAnalysis *Print Output from Item Analysis to Screen*

Description

The function takes an ItemAnalysis object, created by the ItemAnalysis() function, and prints out Cronbach Alpha and Item to Factor Loadings, suggesting item deletions if necessary.

Usage

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

Arguments

x	An ItemAnalysis object, created by the ItemAnalysis() function.
...	Further arguments to be passed on to print generic method.

Details

Threshold for item deletion should have been defined in advance, when applying the PreProc() function.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                             12,5,10,13,2,17,11,9)),
                         orders_id=c(
                           rep(1, 49),
                           rep(2, 49)),
                         reverse=c(3,4,13,14,18,20),
                         col_names= paste('q', 1:20, sep=''))

depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)
print(depressionRel)
```

`print.reliability` *Print Out Summary of Reliability Analysis*

Description

Selectively print Reliability data from an `ItemAnalysis` object, created by the `ItemAnalysis()` function.

Usage

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

Arguments

`x`	A `reliability` object, part of the `ItemAnalysis()` function output, accessible with `it$rely`, where `it` is an `ItemAnalysis` object.
`...`	Further arguments to be passed on to `print` generic method.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                             12,5,10,13,2,17,11,9)),
                         orders_id=c(
                           rep(1, 49),
                           rep(2, 49)),
                         reverse=c(3,4,13,14,18,20),
                         col_names= paste('q', 1:20, sep=''))

depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)

# specifies that you want to print only the
# reliability part of the object.
print(depressionRel$rely)
```

---

print.validity *Print Out Summary of Validity Analysis*

Description

Selectively print Validity data from an `ItemAnalysis` object, created by the `ItemAnalysis()` function.

Usage

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

Arguments

`x`	A `validity` object, part of the `ItemAnalysis()` function output, accessible with `it$valid`, where `it` is an `ItemAnalysis` object.
`...`	Further arguments to be passed on to `print` generic method.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                             12,5,10,13,2,17,11,9)),
                         orders_id=c(
                           rep(1, 49),
                           rep(2, 49)),
                         reverse=c(3,4,13,14,18,20),
                         col_names= paste('q', 1:20, sep=''))

depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)
# specifies that you want to print only the
# validity part of the object.
print(depressionRel$valid)
```

ReadItems *Read Item Statwmwnts from File*

Description

Reads in item statements from file. Actually a wrapper for `readLines()`.

Usage

```
ReadItems(filename, enc)
```

Arguments

`filename`	character. Name of the file containing the items, separated by newlines.
`enc`	character. Character encoding of the file. Defaults to UTF-8.

Note

If you don't know what your encoding already is, try to convert it to UTF-8 with any text editor.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
# not run
# my_items <- ReadItems("my_items.txt")
```

ReportTable *Summarize Item Analysis into Table*

Description

This function takes the output of `ItemAnalysis()` and produces a useful table with item statistics. It also writes the table in the working directory, if asked to.

Usage

```
ReportTable(it, write_file=FALSE, sep=";")
```

Arguments

`it`	Output from `ItemAnalysis`
`write_file`	logical. Should a text file be written?
`sep`	Separator to use in the text output file.

Details

If asked to write a file, it will do so in the working directory.

Value

A data frame with item statistics, specifically:

`Item`	Number or Name of the Item.
`Corr. with Scale`	Correlation of the item with the sum of the rest of the items.
`Factor Loading`	Loading of the Item to a Single Factor
`Mean`	Item Mean
`SD`	Item SD

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                             12,5,10,13,2,17,11,9)),
                         orders_id=c(
```

```
                          rep(1, 49),
                          rep(2, 49)),
                        reverse=c(3,4,13,14,18,20),
                        col_names= paste('q', 1:20, sep=''))
depressionPre <- PreProc(depressionScale)

depressionRel <- ItemAnalysis(depressionPre)

ReportTable(depressionRel)
```

`Scale` *Define Data Set, Reverse Items and Alternate Orders*

Description

Construct a ScaleData object, in order to hold data, item content, administration order(s), reverse items and item column names.

Usage

```
Scale(data, orders, orders_id, reverse, items, col_names)
```

Arguments

`data`	A data.frame with participants as rows and items as columns.
`orders`	A list of the various orders used for reordering the questionnaire administration, if any. Each order is an integer vector.
`orders_id`	An integer vector identifying which order of the questionnaire each participant received.
`reverse`	In the original order, which of the items need to be reversed.
`items`	An optional character vector containing the item statements.
`col_names`	An optional character vector of the desired column names of the items, in the original order.

Value

A `ScaleData` object, with the above arguments named, in order to be passed on to the `PreProc()` function.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
data(Depression98)
depressionScale <- Scale(data=Depression98,
                         orders=list(
                           c(16,19,11,9,1,17,5,18,4,8,2,12,
                             20,10,14,6,3,13,15,7),
                           c(1,18,4,15,7,8,3,14,20,6,19,16,
                           12,5,10,13,2,17,11,9)),
                           orders_id=c(
                                       rep(1, 49),
                                       rep(2, 49)),
                           reverse=c(3,4,13,14,18,20),
                           col_names= paste('q', 1:20, sep=''))
str(depressionScale)
```

ShowItems *Show Content of Empirically Elected Items.*

Description

This function relies to `ChooseBest()` function, in order to print out the content of the highest loading items.

Usage

```
ShowItems(it, n=5, write_file=FALSE, scale_name="MyItems")
```

Arguments

`it`	An `ItemAnalysis` object, created by the `ItemAnalysis()` function.
`n`	integer. Number of items to be retained and printed on screen.
`write_file`	logical. Should a file be written with the elected items?
`scale_name`	character. Name to be used in file, if one should be written.

Details

Items are written to file without their original labels. I chose this way, because use of this function is mainly aimed at passing on elected items to other formatting programs in order to administer. Refer to the output of the function inside R, as well as to the `ChooseItems()` function, for the original item labels.

The default filename is "MyItems.txt". Change the `scale_name` argument to costumize that.

Value

A character vector of the chosen items.

Author(s)

Nikolaos Giallousis, psierevn@gmail.com

Examples

```
# not run

# depressionRel is an ItemAnalysis object
# ShowItems(depressionRel)
# ShowItems(depressionRel, 7)
```

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