Package ‘psychTools’

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Title Tools to Accompany the 'psych' Package for Psychological Research

Description Support functions, data sets, and vignettes for the 'psych' package. Contains several of the biggest data sets for the 'psych' package as well as one vignette. A few helper functions for file manipulation are included as well. For more information, see the <https://personality-project.org/r/> web page.

License GPL (>= 2)

Imports foreign,psych

Suggests parallel, GPArotation, lavaan

Depends R(>= 2.10)

LazyData yes

ByteCompile TRUE

URL `https://personality-project.org/r/psych/`
`https://personality-project.org/r/psych-manual.pdf`

NeedsCompilation no

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R topics documented:

`ability` *16 ability items scored as correct or incorrect.*

Description

16 multiple choice ability items 1525 subjects taken from the Synthetic Aperture Personality Assessment (SAPA) web based personality assessment project are saved as `iqitems`. Those data are shown as examples of how to score multiple choice tests and analyses of response alternatives. When scored correct or incorrect, the data are useful for demonstrations of tetrachoric based factor analysis `irt.fa` and finding tetrachoric correlations.

Usage

```
data(iqitems)
```

Format

A data frame with 1525 observations on the following 16 variables. The number following the name is the item number from SAPA.

`reason.4` Basic reasoning questions

`reason.16` Basic reasoning question

`reason.17` Basic reasoning question

`reason.19` Basic reasoning question

`letter.7` In the following alphanumeric series, what letter comes next?

`letter.33` In the following alphanumeric series, what letter comes next?

`letter.34` In the following alphanumeric series, what letter comes next

`letter.58` In the following alphanumeric series, what letter comes next?

`matrix.45` A matrix reasoning task

`matrix.46` A matrix reasoning task

`matrix.47` A matrix reasoning task

`matrix.55` A matrix reasoning task

`rotate.3` Spatial Rotation of type 1.2

`rotate.4` Spatial Rotation of type 1.2

`rotate.6` Spatial Rotation of type 1.1

`rotate.8` Spatial Rotation of type 2.3

Details

16 items were sampled from 80 items given as part of the SAPA (`https://www.sapa-project.org/`) project (Revelle, Wilt and Rosenthal, 2009; Condon and Revelle, 2014) to develop online measures of ability. These 16 items reflect four lower order factors (verbal reasoning, letter series, matrix reasoning, and spatial rotations. These lower level factors all share a higher level factor ('g').

This data set may be used to demonstrate item response functions, `tetrachoric` correlations, or `irt.fa` as well as `omega` estimates of of reliability and hierarchical structure.

In addition, the data set is a good example of doing item analysis to examine the empirical response probabilities of each item alternative as a function of the underlying latent trait. When doing this, it appears that two of the matrix reasoning problems do not have monotonically increasing trace lines for the probability correct. At moderately high ability (theta = 1) there is a decrease in the probability correct from theta = 0 and theta = 2.

Source

The example data set is taken from the Synthetic Aperture Personality Assessment personality and ability test at `https://www.sapa-project.org/`. The data were collected with David Condon from 8/08/12 to 8/31/12.

Similar data are available from the International Cognitive Ability Resource at `https://www.icar-project.org/`.

References

Revelle, William, Wilt, Joshua, and Rosenthal, Allen (2010) Personality and Cognition: The Personality-Cognition Link. In Gruszka, Alexandra and Matthews, Gerald and Szymura, Blazej (Eds.) Handbook of Individual Differences in Cognition: Attention, Memory and Executive Control, Springer.

Condon, David and Revelle, William, (2014) The International Cognitive Ability Resource: Development and initial validation of a public-domain measure. Intelligence, 43, 52-64.

Examples

```
data(ability)
cs<- psych::cs
keys <- list(ICAR16=colnames(ability),reasoning = cs(reason.4,reason.16,reason.17,reason.19),
  letters=cs(letter.7, letter.33,letter.34,letter.58),
  matrix=cs(matrix.45,matrix.46,matrix.47,matrix.55),
  rotate=cs(rotate.3,rotate.4,rotate.6,rotate.8))
  psych::scoreOverlap(keys,ability)
    #this next step takes a few seconds to run and demonstrates IRT approaches
     ability.irt <- psych::irt.fa(ability)
     ability.scores <- psych::scoreIrt(ability.irt,ability)
     ability.sub.scores <- psych::scoreIrt.2pl(keys,ability) #demonstrate irt scoring
```

---

affect — *Two data sets of affect and arousal scores as a function of personality and movie conditions*

Description

A recurring question in the study of affect is the proper dimensionality and the relationship to various personality dimensions. Here is a data set taken from two studies of mood and arousal using movies to induce affective states.

Usage

```
data(affect)
```

Details

These are data from two studies conducted in the Personality, Motivation and Cognition Laboratory at Northwestern University. Both studies used a similar methodology:

Collection of pretest data using 5 scales from the Eysenck Personality Inventory and items taken from the Motivational State Questionnaire (see msq. In addition, state and trait anxiety measures were given. In the “maps" study, the Beck Depression Inventory was given also.

Then subjects were randomly assigned to one of four movie conditions: 1: Frontline. A documentary about the liberation of the Bergen-Belsen concentration camp. 2: Halloween. A horror film. 3:

National Geographic, a nature film about the Serengeti plain. 4: Parenthood. A comedy. Each film clip was shown for 9 minutes. Following this the MSQ was given again.

Data from the MSQ were scored for Energetic and Tense Arousal (EA and TA) as well as Positive and Negative Affect (PA and NA).

Study flat had 170 participants, study maps had 160.

These studies are described in more detail in various publications from the PMC lab. In particular, Revelle and Anderson, 1997 and Rafaeli and Revelle (2006). An analysis of these data has also appeared in Smillie et al. (2012).

For a much more complete data set involving film, caffeine, and time of day manipulations, see the msqR data set.

Source

Data collected at the Personality, Motivation, and Cognition Laboratory, Northwestern University.

References

Revelle, William and Anderson, Kristen Joan (1997) Personality, motivation and cognitive performance: Final report to the Army Research Institute on contract MDA 903-93-K-0008

Rafaeli, Eshkol and Revelle, William (2006), A premature consensus: Are happiness and sadness truly opposite affects? Motivation and Emotion, 30, 1, 1-12.

Smillie, Luke D. and Cooper, Andrew and Wilt, Joshua and Revelle, William (2012) Do Extraverts Get More Bang for the Buck? Refining the Affective-Reactivity Hypothesis of Extraversion. Journal of Personality and Social Psychology, 103 (2), 206-326.

Examples

```
data(affect)
psych::describeBy(affect[-1],group="Film")
psych::pairs.panels(affect[14:17],bg=c("red","black","white","blue")[affect$Film],pch=21,
    main="Affect varies by movies ")
psych::errorCircles("EA2","TA2",data=affect,group="Film",labels=c("Sad","Fear","Neutral","Humor")
, main="Enegetic and Tense Arousal by Movie condition")
psych::errorCircles(x="PA2",y="NA2",data=affect,group="Film",labels=c("Sad","Fear","Neutral","
Humor"),  main="Positive and Negative Affect by Movie condition")
```

---

bfi — *25 Personality items representing 5 factors*

Description

25 personality self report items taken from the International Personality Item Pool (ipip.ori.org) were included as part of the Synthetic Aperture Personality Assessment (SAPA) web based personality assessment project. The data from 2800 subjects are included here as a demonstration set for scale construction, factor analysis, and Item Response Theory analysis. Three additional demographic variables (sex, education, and age) are also included.

Usage

```
data(bfi)
data(bfi.dictionary)
```

Format

A data frame with 2800 observations on the following 28 variables. (The q numbers are the SAPA item numbers).

`A1` Am indifferent to the feelings of others. (q_146)

`A2` Inquire about others' well-being. (q_1162)

`A3` Know how to comfort others. (q_1206)

`A4` Love children. (q_1364)

`A5` Make people feel at ease. (q_1419)

`C1` Am exacting in my work. (q_124)

`C2` Continue until everything is perfect. (q_530)

`C3` Do things according to a plan. (q_619)

`C4` Do things in a half-way manner. (q_626)

`C5` Waste my time. (q_1949)

`E1` Don't talk a lot. (q_712)

`E2` Find it difficult to approach others. (q_901)

`E3` Know how to captivate people. (q_1205)

`E4` Make friends easily. (q_1410)

`E5` Take charge. (q_1768)

`N1` Get angry easily. (q_952)

`N2` Get irritated easily. (q_974)

`N3` Have frequent mood swings. (q_1099

`N4` Often feel blue. (q_1479)

`N5` Panic easily. (q_1505)

`O1` Am full of ideas. (q_128)

`O2` Avoid difficult reading material.(q_316)

`O3` Carry the conversation to a higher level. (q_492)

`O4` Spend time reflecting on things. (q_1738)

`O5` Will not probe deeply into a subject. (q_1964)

`gender` Males = 1, Females =2

`education` 1 = HS, 2 = finished HS, 3 = some college, 4 = college graduate 5 = graduate degree

`age` age in years

Details

The first 25 items are organized by five putative factors: Agreeableness, Conscientiousness, Extraversion, Neuroticism, and Opennness. The scoring key is created using `make.keys`, the scores are found using `score.items`.

These five factors are a useful example of using `irt.fa` to do Item Response Theory based latent factor analysis of the `polychoric` correlation matrix. The endorsement plots for each item, as well as the item information functions reveal that the items differ in their quality.

The item data were collected using a 6 point response scale: 1 Very Inaccurate 2 Moderately Inaccurate 3 Slightly Inaccurate 4 Slightly Accurate 5 Moderately Accurate 6 Very Accurate

as part of the Synthetic Apeture Personality Assessment (SAPA `https://www.sapa-project.org/`) project. To see an example of the data collection technique, visit `https://www.SAPA-project.org/` or the International Cognitive Ability Resource at `https://icar-project.org`. The items given were sampled from the International Personality Item Pool of Lewis Goldberg using the sampling technique of SAPA. This is a sample data set taken from the much larger SAPA data bank.

Note

The bfi data set and items should not be confused with the BFI (Big Five Inventory) of Oliver John and colleagues (John, O. P., Donahue, E. M., & Kentle, R. L. (1991). The Big Five Inventory–Versions 4a and 54. Berkeley, CA: University of California,Berkeley, Institute of Personality and Social Research.)

Source

The items are from the ipip (Goldberg, 1999). The data are from the SAPA project (Revelle, Wilt and Rosenthal, 2010) , collected Spring, 2010 (`https://www.sapa-project.org/`).

References

Goldberg, L.R. (1999) A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In Mervielde, I. and Deary, I. and De Fruyt, F. and Ostendorf, F. (eds) Personality psychology in Europe. 7. Tilburg University Press. Tilburg, The Netherlands.

Revelle, W., Wilt, J., and Rosenthal, A. (2010) Individual Differences in Cognition: New Methods for examining the Personality-Cognition Link In Gruszka, A. and Matthews, G. and Szymura, B. (Eds.) Handbook of Individual Differences in Cognition: Attention, Memory and Executive Control, Springer.

Revelle, W, Condon, D.M., Wilt, J., French, J.A., Brown, A., and Elleman, L.G. (2016) Web and phone based data collection using planned missing designs. In Fielding, N.G., Lee, R.M. and Blank, G. (Eds). SAGE Handbook of Online Research Methods (2nd Ed), Sage Publcations.

See Also

`bi.bars` to show the data by age and gender, `irt.fa` for item factor analysis applying the irt model.

Examples

```
data(bfi)
psych::describe(bfi)
# create the bfi.keys (actually already saved in the data file)
 bfi.keys <-
  list(agree=c("-A1","A2","A3","A4","A5"),conscientious=c("C1","C2","C3","-C4","-C5"),
extraversion=c("-E1","-E2","E3","E4","E5"),neuroticism=c("N1","N2","N3","N4","N5"),
openness = c("O1","-O2","O3","O4","-O5"))

 scores <- psych::scoreItems(bfi.keys,bfi,min=1,max=6) #specify the minimum and maximum values
 scores
 #show the use of the keys.lookup with a dictionary
 psych::keys.lookup(bfi.keys,bfi.dictionary[,1:4])
```

---

blant *A 29 x 29 matrix that produces weird factor analytic results*

Description

Normally, min.res factor analysis and maximum likelihood produce very similar results. This data set (from Alexandra Blant) does not. Warnings are given for the min.res solution, the pa solution, but not the old.min nor the mle solution. Included as a test case for the factor analysis function.

Usage

```
data("blant")
```

Format

The format is: num [1:29, 1:29] 1 0.77 0.813 0.68 0.717 ... - attr(*, "dimnames")=List of 2 ..$: NULL ..$: chr [1:29] "V1" "V2" "V3" "V4" ...

Details

This data matrix was sent by Alexandra Blant as an example of a problem with the minres solution in the `fa` function. The default solution, using fm="minres" issues a warning that the solution has improper factor score weights. This is not the case for the fm="old.min" and fm="mle" options, but is for fm="pa", fm="ols".

The residuals are indeed smaller for fm="minres" than for fm="old.min" or fm="mle".

"old.min" attempts to find the minimum residual but uses the gradient for mle. This was the approach until version 1.7.5 but was changed (see the help page for fa) following extensive communication with Hao Wu.

The problem with this matrix is probably that it is almost singular, with some smcs approaching 1 and the smallest three eigenvalues of .006, .004 and .001.

This problem matrix was provided by Alexandra Blant.

Source

Alexandra Blant, personal communication

Examples

```
data(blant)
#compare
f5 <- psych::fa(blant,5,rotate="none")  #the default minres
f5.old <- psych::fa(blant,5, fm="old.min",rotate="none") #old version of minres
f5.mle <- psych::fa(blant,5,fm="mle",rotate= "none") #maximum likelihood
#compare solutions
psych::factor.congruence(list(f5,f5.old,f5.mle))
#compare sums of squared residuals
sum(residuals(f5,diag=FALSE)^2,na.rm=TRUE) # 1.355489
sum(residuals(f5.old,diag=FALSE)^2,na.rm=TRUE) # 1.539757
sum(residuals(f5.mle,diag=FALSE)^2,na.rm=TRUE) # 2.402092

#but, when we divide the squared residuals by the original (squared) correlations, we find
#a different ordering of fit
f5$fit     # 0.9748177
f5.old$fit  # 0.9752774
f5.mle$fit   # 0.9603324
```

---

blot — *Bond's Logical Operations Test – BLOT*

Description

35 items for 150 subjects from Bond's Logical Operations Test. A good example of Item Response Theory analysis using the Rasch model. One parameter (Rasch) analysis and two parameter IRT analyses produce somewhat different results.

Usage

```
data(blot)
```

Format

A data frame with 150 observations on 35 variables. The BLOT was developed as a paper and pencil test for children to measure Logical Thinking as discussed by Piaget and Inhelder.

Details

Bond and Fox apply Rasch modeling to a variety of data sets. This one, Bond's Logical Operations Test, is used as an example of Rasch modeling for dichotomous items. In their text (p 56), Bond and Fox report the results using WINSTEPS. Those results are consistent (up to a scaling parameter) with those found by the rasch function in the ltm package. The WINSTEPS seem to produce difficulty estimates with a mean item difficulty of 0, whereas rasch from ltm has a mean difficulty of -1.52. In addition, rasch seems to reverse the signs of the difficulty estimates when reporting the coefficients and is effectively reporting "easiness".

However, when using a two parameter model, one of the items (V12) behaves very differently.

This data set is useful when comparing 1PL, 2PL and 2PN IRT models.

Source

The data are taken (with kind permission from Trevor Bond) from the webpage https://www.winsteps.com/BF3/bondfox3.htm and read using read.fwf.

References

T.G. Bond. BLOT:Bond's Logical Operations Test. Townsville, Australia: James Cook University. (Original work published 1976), 1995.

T. Bond and C. Fox. (2007) Applying the Rasch model: Fundamental measurement in the human sciences. Lawrence Erlbaum, Mahwah, NJ, US, 2 edition.

See Also

See also the irt.fa and associated plot functions.

Examples

```
data(blot)

 #ltm is not required by psychTools, but if available, may be run to show a Rasch model

#do the same thing with functions in psych
blot.fa <- psych::irt.fa(blot)  # a 2PN model
plot(blot.fa)
```

---

burt *11 emotional variables from Burt (1915)*

Description

Cyril Burt reported an early factor analysis with a circumplex structure of 11 emotional variables in 1915. 8 of these were subsequently used by Harman in his text on factor analysis. Unfortunately, it seems as if Burt made a mistake for the matrix is not positive definite. With one change from .87 to .81 the matrix is positive definite.

Usage

```
data(burt)
```

Format

A correlation matrix based upon 172 "normal school age children aged 9-12".

Sociality Sociality

Sorrow Sorrow

Tenderness Tenderness

Joy Joy

Wonder Wonder

Elation Elation

Disgust Disgust

Anger Anger

Sex Sex

Fear Fear

Subjection Subjection

Details

The Burt data set is interesting for several reasons. It seems to be an early example of the organizaton of emotions into an affective circumplex, a subset of it has been used for factor analysis examples (see `Harman.Burt`, and it is an example of how typos affect data. The original data matrix has one negative eigenvalue. With the replacement of the correlation between Sorrow and Tenderness from .87 to .81, the matrix is positive definite.

Alternatively, using `cor.smooth`, the matrix can be made positive definite as well, although cor.smooth makes more (but smaller) changes.

Source

(retrieved from the web at https://www.biodiversitylibrary.org/item/95822#790) Following a suggestion by Jan DeLeeuw.

References

Burt, C.General and Specific Factors underlying the Primary Emotions. Reports of the British Association for the Advancement of Science, 85th meeting, held in Manchester, September 7-11, 1915. London, John Murray, 1916, p. 694-696 (retrieved from the web at https://www.biodiversitylibrary.org/item/95822#790)

See Also

`Harman.Burt` in the `Harman` dataset and `cor.smooth`

Examples

```
data(burt)
eigen(burt)$values  #one is negative!
burt.new <- burt
burt.new[2,3] <- burt.new[3,2] <- .81
eigen(burt.new)$values  #all are positive
bs <- psych::cor.smooth(burt)
round(burt.new - bs,3)
```

---

cities *Distances between 11 US cities*

Description

Airline distances between 11 US cities may be used as an example for multidimensional scaling or cluster analysis.

Usage

```
data(cities)
```

Format

A data frame with 11 observations on the following 11 variables.

- `ATL` Atlana, Georgia
- `BOS` Boston, Massachusetts
- `ORD` Chicago, Illinois
- `DCA` Washington, District of Columbia
- `DEN` Denver, Colorado
- `LAX` Los Angeles, California
- `MIA` Miami, Florida
- `JFK` New York, New York
- `SEA` Seattle, Washington
- `SFO` San Francisco, California
- `MSY` New Orleans, Lousianna

Details

An 11 x11 matrix of distances between major US airports. This is a useful demonstration of multiple dimensional scaling.

city.location is a dataframe of longitude and latitude for those cities.

Note that the 2 dimensional MDS solution does not perfectly capture the data from these city distances. Boston, New York and Washington, D.C. are located slightly too far west, and Seattle and LA are slightly too far south.

Source

https://www.timeanddate.com/worldclock/distance.html

Examples

```
data(cities)
city.location[,1] <- -city.location[,1] #included in the cities data set
plot(city.location, xlab="Dimension 1", ylab="Dimension 2",
   main ="Multidimensional scaling of US cities")
#do the mds
city.loc <- cmdscale(cities, k=2) #ask for a 2 dimensional solution  round(city.loc,0)
city.loc <- -city.loc  #flip the axes
 city.loc <- psych::rescale(city.loc,apply(city.location,2,mean),apply(city.location,2,sd))
points(city.loc,type="n") #add the date point to the map
text(city.loc,labels=names(cities))

## Not run:    #we need the maps package to be available
#an overlay map can be added if the package maps is available
if(require(maps)) {
  map("usa",add=TRUE)
}

## End(Not run)
```

---

cubits *Galton's example of the relationship between height and 'cubit' or forearm length*

Description

Francis Galton introduced the 'co-relation' in 1888 with a paper discussing how to measure the relationship between two variables. His primary example was the relationship between height and forearm length. The data table (cubits) is taken from Galton (1888). Unfortunately, there seem to be some errors in the original data table in that the marginal totals do not match the table.

The data frame, heights, is converted from this table.

Usage

```
data(cubits)
```

Format

A data frame with 9 observations on the following 8 variables.

16.5 Cubit length < 16.5

16.75 16.5 <= Cubit length < 17.0

17.25 17.0 <= Cubit length < 17.5

17.75	17.5 <= Cubit length < 18.0
18.25	18.0 <= Cubit length < 18.5
18.75	18.5 <= Cubit length < 19.0
19.25	19.0 <= Cubit length < 19.5
19.75	19.5 <= Cubit length

Details

Sir Francis Galton (1888) published the first demonstration of the correlation coefficient. The regression (or reversion to mediocrity) of the height to the length of the left forearm (a cubit) was found to .8. There seem to be some errors in the table as published in that the row sums do not agree with the actual row sums. These data are used to create a matrix using table2matrix for demonstrations of analysis and displays of the data.

Source

Galton (1888)

References

Galton, Francis (1888) Co-relations and their measurement. Proceedings of the Royal Society. London Series,45,135-145,

See Also

table2matrix, table2df, ellipses, heights, peas,galton

Examples

```
data(cubits)
cubits
heights <- psych::table2df(cubits,labs = c("height","cubit"))
psych::ellipses(heights,n=1,main="Galton's co-relation data set")
psych::ellipses(jitter(heights$height,3),jitter(heights$cubit,3),pch=".",
     main="Galton's co-relation data set",xlab="height",
     ylab="Forearm (cubit)") #add in some noise to see the points
psych::pairs.panels(heights,jiggle=TRUE,main="Galton's cubits data set")
```

---

cushny

A data set from Cushny and Peebles (1905) on the effect of three drugs on hours of sleep, used by Student (1908)

Description

The classic data set used by Gossett (publishing as Student) for the introduction of the t-test. The design was a within subjects study with hours of sleep in a control condition compared to those in 3 drug conditions. Drug1 was 06mg of L Hscyamine, Drug 2L and Drug2R were said to be .6 mg of Left and Right isomers of Hyoscine. As discussed by Zabell (2008) these were not optical isomers. The detal1, delta2L and delta2R are changes from the baseline control.

Usage

```
data(cushny)
```

Format

A data frame with 10 observations on the following 7 variables.

`Control` Hours of sleep in a control condition

`drug1` Hours of sleep in Drug condition 1

`drug2L` Hours of sleep in Drug condition 2

`drug2R` Hours of sleep in Drug condition 3 (an isomer of the drug in condition 2

`delta1` Change from control, drug 1

`delta2L` Change from control, drug 2L

`delta2R` Change from control, drug 2R

Details

The original analysis by Student is used as an example for the t-test function, both as a paired t-test and a two group t-test. The data are also useful for a repeated measures analysis of variance.

Source

Cushny, A.R. and Peebles, A.R. (1905) The action of optical isomers: II hyoscines. The Journal of Physiology 32, 501-510.

Student (1908) The probable error of the mean. Biometrika, 6 (1) , 1-25.

References

See also the data set sleep and the examples for the t.test

S. L. Zabell. On Student's 1908 Article "The Probable Error of a Mean" Journal of the American Statistical Association, Vol. 103, No. 481 (Mar., 2008), pp. 1- 20

Examples

```
data(cushny)
with(cushny, t.test(drug1,drug2L,paired=TRUE)) #within subjects

psych::error.bars(cushny[1:4],within=TRUE,ylab="Hours of sleep",xlab="Drug condition",
      main="95% confidence of within subject effects")
```

df2latex *Convert a data frame, correlation matrix, or factor analysis output to a LaTeX table*

Description

A set of handy helper functions to convert data frames or matrices to LaTeX tables. Although Sweave is the preferred means of converting R output to LaTeX, it is sometimes useful to go directly from a data.frame or matrix to a LaTeX table. cor2latex will find the correlations and then create a lower (or upper) triangular matrix for latex output. fa2latex will create the latex commands for showing the loadings and factor intercorrelations. As the default option, tables are prepared in an approximation of APA format.

Usage

```
df2latex(x,digits=2,rowlabels=TRUE,apa=TRUE,short.names=TRUE,font.size ="scriptsize",
      big.mark=NULL,drop.na=TRUE, heading="A table from the psych package in R",
   caption="df2latex",label="default", char=FALSE,
    stars=FALSE,silent=FALSE,file=NULL,append=FALSE,cut=0,big=0,abbrev=NULL)
cor2latex(x,use = "pairwise", method="pearson", adjust="holm",stars=FALSE,
       digits=2,rowlabels=TRUE,lower=TRUE,apa=TRUE,short.names=TRUE,
   font.size ="scriptsize", heading="A correlation table from the psych package in R.",
    caption="cor2latex",label="default",silent=FALSE,file=NULL,append=FALSE,cut=0,big=0)
fa2latex(f,digits=2,rowlabels=TRUE,apa=TRUE,short.names=FALSE,cumvar=FALSE,
       cut=0,big=.3,alpha=.05,font.size ="scriptsize",
       heading="A factor analysis table from the psych package in R",
       caption="fa2latex",label="default",silent=FALSE,file=NULL,append=FALSE)
omega2latex(f,digits=2,rowlabels=TRUE,apa=TRUE,short.names=FALSE,cumvar=FALSE,cut=.2,
        font.size ="scriptsize",
        heading="An omega analysis table from the psych package in R",
     caption="omega2latex",label="default",silent=FALSE,file=NULL,append=FALSE)

irt2latex(f,digits=2,rowlabels=TRUE,apa=TRUE,short.names=FALSE,
       font.size ="scriptsize", heading="An IRT factor analysis table from R",
       caption="fa2latex",label="default",silent=FALSE,file=NULL,append=FALSE)
ICC2latex(icc,digits=2,rowlabels=TRUE,apa=TRUE,ci=TRUE,
   font.size ="scriptsize",big.mark=NULL, drop.na=TRUE,
    heading="A table from the psych package in R",
  caption="ICC2latex",label="default",char=FALSE,silent=FALSE,file=NULL,append=FALSE)
```

Arguments

`x`	A data frame or matrix to convert to LaTeX. If non-square, then correlations will be found prior to printing in cor2latex
`digits`	Round the output to digits of accuracy. NULL for formatting character data
`abbrev`	How many characters should be used in column names –defaults to digits + 3

`rowlabels`	If TRUE, use the row names from the matrix or data.frame
`short.names`	Name the columns with abbreviated rownames to save space
`apa`	If TRUE formats table in APA style
`cumvar`	For factor analyses, should we show the cumulative variance accounted for?
`font.size`	e.g., "scriptsize", "tiny" or anyother acceptable LaTeX font size.
`heading`	The label appearing at the top of the table
`caption`	The table caption
`lower`	in cor2latex, just show the lower triangular matrix
`f`	The object returned from a factor analysis using `fa` or `irt.fa`.
`label`	The label for the table
`big.mark`	Comma separate numbers large numbers (big.mark=",")
`drop.na`	Do not print NA values
`method`	When finding correlations, which method should be used (pearson)
`use`	use="pairwise" is the default when finding correlations in cor2latex
`adjust`	If showing probabilities, which adjustment should be used (holm)
`stars`	Should probability 'magic astericks' be displayed in cor2latex (FALSE)
`char`	char=TRUE allows printing tables with character information, but does not allow for putting in commas into numbers
`cut`	In omega2latex, df2latex and fa2latex, do not print abs(values) < cut
`big`	In fa2latex and df2latex boldface those abs(values) > big
`alpha`	If fa has returned confidence intervals, then what values of loadings should be boldfaced?
`icc`	Either the output of an ICC, or the data to be analyzed.
`ci`	Should confidence intervals of the ICC be displayed
`silent`	If TRUE, do not print any output, just return silently – useful if using Sweave
`file`	If specified, write the output to this file
`append`	If file is specified, then should we append (append=TRUE) or just write to the file

Value

A LaTeX table. Note that if showing "stars" for correlations, then one needs to use the siunitx package in LaTex. The entire LaTeX output is also returned invisibly. If using Sweave to create tables, then the silent option should be set to TRUE and the returned object saved as a file. See the last example.

Author(s)

William Revelle with suggestions from Jason French and David Condon and Davide Morselli

See Also

The many LaTeX conversion routines in Hmisc.

Examples

```
df2latex(psych::Thurstone,rowlabels=FALSE,apa=FALSE,short.names=FALSE,
        caption="Thurstone Correlation matrix")
df2latex(psych::Thurstone,heading="Thurstone Correlation matrix in APA style")

df2latex(psych::describe(psych::sat.act)[2:10],short.names=FALSE)
cor2latex(psych::Thurstone)
cor2latex(psych::sat.act,short.names=FALSE)
fa2latex(psych::fa(psych::Thurstone,3),heading="Factor analysis from R in quasi APA style")


 #If using Sweave to create a LateX table as a separate file then set silent=TRUE
#e.g.,
#LaTex preamble
#....
#<<print=FALSE,echo=FALSE>>=
#f3 <- fa(Thurstone,3)
#fa2latex(f3,silent=TRUE,file='testoutput.tex')
#@
#
#\input{testoutput.tex}
```

`dfOrder` *Sort (order) a dataframe or matrix by multiple columns*

Description

Although `order` will order a vector, and it is possible to order several columns of a data.frame by specifying each column individually in the call to order, `dfOrder` will order a dataframe or matrix by as many columns as desired.

Usage

```
dfOrder(object, columns,absolute=FALSE,ascending=TRUE)
```

Arguments

`object`	The data.frame to be sorted
`columns`	Column numbers to use for sorting. If positive, then they will be sorted in increasing order. If negative, then in decreasing order
`absolute`	If TRUE, then sort the absolute values
`ascending`	By default, order from smallest to largest.

Details

This is just a simple helper function to reorder data.frames. Originally developed to organize IRT output from the ltm package. It is a basic add on to the order function.

(Completely rewritten for version 1.8.1.)

Value

The original data frame is now in sorted order.

Author(s)

William Revelle

See Also

Other useful file manipulation functions include `read.file` to read in data from a file or `read.clipboard` from the clipboard, `fileScan`, `filesList`, `filesInfo`, and `fileCreate`

`dfOrder` code is used in the `test.irt` function to combine ltm and `sim.irt` output.

Examples

```
set.seed(42)
x <- matrix(sample(1:4,64,replace=TRUE),ncol=4)
dfOrder(x)  # sort by all columns
dfOrder(x,c(1,4))  #sort by the first and 4th column
x.df <- data.frame(x)
dfOrder(x.df,c(1,-2))  #sort by the first in increasing order,
   #the second in decreasing order
```

`epi` *Eysenck Personality Inventory (EPI) data for 3570 participants*

Description

The EPI is and has been a very frequently administered personality test with 57 measuring two broad dimensions, Extraversion-Introversion and Stability-Neuroticism, with an additional Lie scale. Developed by Eysenck and Eysenck, 1964. Eventually replaced with the EPQ which measures three broad dimensions. This data set represents 3570 observations collected in the early 1990s at the Personality, Motivation and Cognition lab at Northwestern. An additional data set (epiR) has test and retest information for 474 participants. The data are included here as demonstration of scale construction and test-retest reliability.

Usage

```
data(epi)
data(epi.dictionary)
data(epiR)
```

Format

A data frame with 3570 observations on the following 57 variables.

`id` The identification number within the study

`time` First (group testing) or 2nd time (before a lab experiment) for the epiR data set.

`study` Four lab based studies and their pretest data

`V1` a numeric vector

`V2` a numeric vector

`V3` a numeric vector

`V4` a numeric vector

`V5` a numeric vector

`V6` a numeric vector

`V7` a numeric vector

`V8` a numeric vector

`V9` a numeric vector

`V10` a numeric vector

`V11` a numeric vector

`V12` a numeric vector

`V13` a numeric vector

`V14` a numeric vector

`V15` a numeric vector

`V16` a numeric vector

`V17` a numeric vector

`V18` a numeric vector

`V19` a numeric vector

`V20` a numeric vector

`V21` a numeric vector

`V22` a numeric vector

`V23` a numeric vector

`V24` a numeric vector

`V25` a numeric vector

`V26` a numeric vector

`V27` a numeric vector

`V28` a numeric vector

`V29` a numeric vector

`V30` a numeric vector

`V31` a numeric vector

`V32` a numeric vector

`V33` a numeric vector

`V34` a numeric vector

`V35` a numeric vector

`V36` a numeric vector

`V37` a numeric vector

`V38` a numeric vector

`V39` a numeric vector

`V40` a numeric vector

`V41` a numeric vector

`V42` a numeric vector

`V43` a numeric vector

`V44` a numeric vector

`V45` a numeric vector

`V46` a numeric vector

`V47` a numeric vector

`V48` a numeric vector

`V49` a numeric vector

`V50` a numeric vector

`V51` a numeric vector

`V52` a numeric vector

`V53` a numeric vector

`V54` a numeric vector

`V55` a numeric vector

`V56` a numeric vector

`V57` a numeric vector

Details

The original data were collected in a group testing framework for screening participants for subsequent studies. The participants were enrolled in an introductory psychology class between Fall, 1991 and Spring, 1995.

The actual items may be found in the `epi.dictionary`.

The structure of the E scale has been shown by Rocklin and Revelle (1981) to have two subcomponents, Impulsivity and Sociability. These were subsequently used by Revelle, Humphreys, Simon and Gilliland to examine the relationship between personality, caffeine induced arousal, and cognitive performance.

The epiR data include the original group testing data and matched data for 474 participants collected several weeks later. This is useful for showing that internal consistency estimates (e.g. `alpha` or `omega`) can be low even though the test is stable across time. For more demonstrations of the distinction between immediate internal consistency and delayed test-retest reliability see the `msqR` and `sai` data sets and `testRetest`.

Source

Data from the PMC laboratory at Northwestern.

References

Eysenck, H.J. and Eysenck, S. B.G. (1968). Manual for the Eysenck Personality Inventory.Educational and Industrial Testing Service, San Diego, CA.

Rocklin, T. and Revelle, W. (1981). The measurement of extraversion: A comparison of the Eysenck Personality Inventory and the Eysenck Personality Questionnaire. British Journal of Social Psychology, 20(4):279-284.

Examples

```
data(epi)
epi.keys <- list(E = c("V1",  "V3",  "V8",  "V10", "V13", "V17", "V22", "V25", "V27", "V39",
  "V44", "V46", "V49", "V53", "V56", "-V5", "-V15", "-V20", "-V29", "-V32", "-V34","-V37",
   "-V41", "-V51"),
N = c( "V2", "V4", "V7", "V9", "V11", "V14", "V16", "V19", "V21", "V23", "V26", "V28",
"V31", "V33", "V35", "V38", "V40","V43", "V45", "V47", "V50", "V52","V55", "V57"),
L = c("V6",  "V24", "V36", "-V12", "-V18", "-V30", "-V42", "-V48", "-V54"),
Imp = c( "V1",  "V3",  "V8",  "V10", "V13", "V22", "V39", "-V5", "-V41"),
Soc = c( "V17", "V25", "V27", "V44", "V46", "V53", "-V11", "-V15", "-V20",
"-V29", "-V32", "-V37", "-V51")
)
scores <- psych::scoreItems(epi.keys,epi)

psych::keys.lookup(epi.keys[1:3],epi.dictionary) #show the items and keying information

#a variety of demonstrations (not run) of test retest reliability versus alpha versus omega

E <- psych::selectFromKeys(epi.keys$E)
#look at the testRetest help file for more examples
```

`epi.bfi` *13 personality scales from the Eysenck Personality Inventory and Big 5 inventory*

Description

A small data set of 5 scales from the Eysenck Personality Inventory, 5 from a Big 5 inventory, a Beck Depression Inventory, and State and Trait Anxiety measures. Used for demonstrations of correlations, regressions, graphic displays.

Usage

```
data(epi.bfi)
```

Format

A data frame with 231 observations on the following 13 variables.

`epiE` EPI Extraversion

`epiS` EPI Sociability (a subset of Extraversion items

`epiImp` EPI Impulsivity (a subset of Extraversion items

`epilie` EPI Lie scale

`epiNeur` EPI neuroticism

`bfagree` Big 5 inventory (from the IPIP) measure of Agreeableness

`bfcon` Big 5 Conscientiousness

`bfext` Big 5 Extraversion

`bfneur` Big 5 Neuroticism

`bfopen` Big 5 Openness

`bdi` Beck Depression scale

`traitanx` Trait Anxiety

`stateanx` State Anxiety

Details

Self report personality scales tend to measure the "Giant 2" of Extraversion and Neuroticism or the "Big 5" of Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness. Here is a small data set from Northwestern University undergraduates with scores on the Eysenck Personality Inventory (EPI) and a Big 5 inventory taken from the International Personality Item Pool.

Source

Data were collected at the Personality, Motivation, and Cognition Lab (PMCLab) at Northwestern by William Revelle)

References

https://personality-project.org/pmc.html

Examples

```
data(epi.bfi)
psych::pairs.panels(epi.bfi[,1:5])
psych::describe(epi.bfi)
```

galton *Galton's Mid parent child height data*

Description

Two of the earliest examples of the correlation coefficient were Francis Galton's data sets on the relationship between mid parent and child height and the similarity of parent generation peas with child peas. This is the data set for the Galton height.

Usage

```
data(galton)
```

Format

A data frame with 928 observations on the following 2 variables.

`parent` Mid Parent heights (in inches)

`child` Child Height

Details

Female heights were adjusted by 1.08 to compensate for sex differences. (This was done in the original data set)

Source

This is just the galton data set from UsingR, slightly rearranged.

References

Stigler, S. M. (1999). Statistics on the Table: The History of Statistical Concepts and Methods. Harvard University Press. Galton, F. (1886). Regression towards mediocrity in hereditary stature. Journal of the Anthropological Institute of Great Britain and Ireland, 15:246-263. Galton, F. (1869). Hereditary Genius: An Inquiry into its Laws and Consequences. London: Macmillan.

Wachsmuth, A.W., Wilkinson L., Dallal G.E. (2003). Galton's bend: A previously undiscovered nonlinearity in Galton's family stature regression data. The American Statistician, 57, 190-192.

See Also

The other Galton data sets: `heights`, `peas`,`cubits`

Examples

```
data(galton)
psych::describe(galton)
 #show the scatter plot and the lowess fit
psych::pairs.panels(galton,main="Galton's Parent child heights")
#but this makes the regression lines look the same
psych::pairs.panels(galton,lm=TRUE,main="Galton's Parent child heights")
 #better is to scale them
psych::pairs.panels(galton,lm=TRUE,xlim=c(62,74),ylim=c(62,74),
             main="Galton's Parent child heights")
```

---

heights — *A data.frame of the Galton (1888) height and cubit data set.*

Description

Francis Galton introduced the 'co-relation' in 1888 with a paper discussing how to measure the relationship between two variables. His primary example was the relationship between height and forearm length. The data table (`cubits`) is taken from Galton (1888). Unfortunately, there seem to be some errors in the original data table in that the marginal totals do not match the table.

The data frame, `heights`, is converted from this table using `table2df`.

Usage

```
data(heights)
```

Format

A data frame with 348 observations on the following 2 variables.

`height` Height in inches

`cubit` Forearm length in inches

Details

Sir Francis Galton (1888) published the first demonstration of the correlation coefficient. The regression (or reversion to mediocrity) of the height to the length of the left forearm (a cubit) was found to .8. The original table `cubits` is taken from Galton (1888). There seem to be some errors in the table as published in that the row sums do not agree with the actual row sums. These data are used to create a matrix using `table2matrix` for demonstrations of analysis and displays of the data.

Source

Galton (1888)

References

Galton, Francis (1888) Co-relations and their measurement. Proceedings of the Royal Society. London Series,45,135-145,

See Also

table2matrix, table2df, cubits, ellipses, galton

Examples

```
data(heights)
psych::ellipses(heights,n=1,main="Galton's co-relation data set")
```

---

holzinger.swineford *The raw and transformed data from Holzinger and Swineford, 1939*

Description

A classic data set in psychometrics is that from Holzinger and Swineford (1939). A 4 and 5 factor solution to 24 of these variables problem is presented by Harman (1976), and 9 of these are used by the lavaan package. The two data sets were supplied by Keith Widaman.

Usage

```
data(holzinger.swineford)
     data(holzinger.raw)
     data(holzinger.dictionary)
```

Format

A data frame with 301 observations on the following 33 variables. Longer descriptions taken from Thompson, (1998).

`case` a numeric vector

`school` School Pasteur or Grant-White

`grade` Grade (7 or 8)

`female` male = 1, female = 2

`ageyr` age in years

`mo` months over year

`agemo` Age in months

`t01_visperc` Visual perception test from Spearman VPT Part I

`t02_cubes` Cubes, Simplification of Brighams Spatial Relations Test

`t03_frmbord` Paper formboard-Shapes that can be combined to form a target `t04_lozenges` Lozenges from Thorndike-Shapes flipped over then identify target

`t05_geninfo` General Information Verbal Test

`t06_paracomp` Paragraph Comprehension Test

`t07_sentcomp` Sentence Completion Test

`t08_wordclas` Word clasification-Which word not belong in set

`t09_wordmean` Word Meaning Test

`t10_addition` Speeded addition test

`t11_code` Speeded codetest-Transform shapes into alpha with code

`t12_countdot` Speeded counting of dots in shap

`t13_sccaps` Speeded discrimation of straight and curved caps

`t14_wordrecg` Memory of Target Words

`t15_numbrecg` Memory of Target Numbers

`t16_figrrecg` Memory of Target Shapes

`t17_objnumb` Memory of object-Number association targets

`t18_numbfig` Memory of number-Object association targets

`t19_figword` Memory of figure-Word association target

`t20_deduction` Deductive Math Ability

`t21_numbpuzz` Math number puzzles

`t22_probreas` Math word problem reasoning

`t23_series` Completion of a Math Number Series

`t24_woody` Woody-McCall mixed math fundamentals test

`t25_frmbord2` Revision of t3-Paper form board

`t26_flags` Flags-possible substitute for t4 lozenges

Details

The following commentary was provided by Keith Widaman:

“The Holzinger and Swineford (1939) data have been used as a model data set by many investigators. For example, Harman (1976) used the “24 Psychological Variables" example prominently in his authoritative text on multiple factor analysis, and the data presented under this rubric consisted of 24 of the variables from the Grant-White school (N = 145). Meredith (1964a, 1964b) used several variables from the Holzinger and Swineford study in his work on factorial invariance under selection. Joreskog (1971) based his work on multiple-group confirmatory factor analysis using the Holzinger and Swineford data, subsetting the data into four groups.

Rosseel, who developed the ‘lavaan’ package for R, included 9 of the manifest variables from Holzinger and Swineford (1939) as a “resident" data set when one downloads the ‘lavaan’ package. Several background variables are included in this “resident" data set in addition to 9 of the psychological tests (which are named x1 – x9 in the data set). When analyzing these data, I found the distributions of the variables (means, SDs) did not match the sample statistics from the original article. For example, in the “resident" data set in ‘lavaan’, scores on all manifest variables ranged between 0 and 10, sample means varied between 3 and 6, and sample SDs varied between 1.0 and

1.5. In the original data set, scores ranges were rather different across tests, with some variables having scores that ranged between 0 and 20, but other manifest variables having scores ranging from 50 to over 300 – with obvious attendant differences in sample means and SDs.

After a bit of snooping (i.e., data analysis), I discovered that the 9 variables in the “resident" data set in ‘lavaan’ had been rescored through ratio transformations. The ratio transformations involved dividing the raw score for each person on a given test by a particular constant for that test that transformed scores on the test to have the desired range.

I decided to perform transformations of all 26 variables so that two data sets could be available to interested researchers:"

holzinger.raw are the raws scores on all variables from Holzinger & Swineford (1939)

holzinger.swineford are rescaled scores on all variables from Holzinger & Swineford.

holzinger.dictionary is a list of the variable names in short and long form.

... Widaman continues:

“As several persons have noted, Harman (1976) used data only from the Grant-White school (N = 145) for his 24 Psychological Variables data set. In doing so, Harman replaced t03_frmbord and t04_lozenges with t25_frmbord2 and t26_flags, because the latter two tests were experimental tests that were designed to be more appropriate for this age level. This substitution is fine, as long as one analyzes data from only the Grant- White school. If one wishes to perform multiple-group analyses and uses school as a grouping variable (as Meredith, 1964a, 1964b, and Joreskog, 1971, did), then tests 25 and 26 should not be used."

“As have others, Gorsuch (1983) mentioned that analyses based on the raw data reported by Holzinger and Swineford (1939) will not produce statistics (means, SDs, correlations) that match precisely the values reported by Holzinger and Swineford or Harman (1976). Following Gorsuch, I have assumed that the raw data are correct. Applying factor analytic techniques to the raw data from the Grant-White school and to the summary data reported by Harman (1976) will produce slightly different results, but results that differ in only minor, unimportant details."

These data are interesting not just for the historical completeness of having the orinal data, but also as an example of suppressor variables. Age and grade are positively correlated, and scores are higher in the 8th grade than in the 7th grade. But age (particularly in months) is negatively correlated with many of the cognitive tasks, and when grade and age are both entered into regression, this negative correlation is enhanced. That is, although increasing grade increases cognitive perforamnce, younger children in both grades do better than the older children.

Note

As discussed by Widaman, the descriptive values reported in Harman (1967) (p 124) do not quite match the descriptive statistics in `holzinger.raw`. Further note that the correlation matrix and factor loadings are trivially different from the Harman.24 factor loadings in the GPA rotation package.

The purpose behind presenting both the raw and transformed data is to show that the fit statistics from factor analysis are identical for these two data sets.

Source

Keith Widaman (2019, personal communication). Original data from Holzinger and Swineford (1939).

References

Gorsuch, R. L. (1983). Factor analysis (2nd ed.). Hillsdale, NJ: Erlbaum.

Harman, Harry Horace (1967), Modern factor analysis. Chicago, University of Chicago Press.

Holzinger, K. J., & Swineford, F. (1939). A study in factor analysis: The stability of a bi-factor solution. Supplementary Educational Monographs, no. 48. Chicago: University of Chicago, Department of Education.

Joreskog, K. G. (1971). Simultaneous factor analysis in several populations. Psychometrika, 36, 409-426.

Meredith, W. (1964a). Notes on factorial invariance. Psychometrika, 29, 177-185.

Meredith, W. (1964b). Rotation to achieve factorial invariance. Psychometrika, 29, 177-206.

Meredith, W. (1977). On weighted Procrustes and hyperplane fitting in factor analytic rotation. Psychometrika, 42, 491-522.

Thompson, Bruce. Five Methodology Errors in Educational Research:The Pantheon of Statistical Significance and Other Faux Pas. Paper presented at the Annual Meeting of the American Educational Research Association(San Diego, CA, April 13-17,1998)

Examples

```
data(holzinger.raw)
psych::describe(holzinger.raw)
data(holzinger.dictionary)
holzinger.dictionary  #to see the longer names for these data (taken from Thompson)

#show suppression effects
psych::setCor(t01_visperc + t05_geninfo + t08_wordclas ~ grade + agemo,data = holzinger.raw)
psych::setCor( t06_paracomp ~ grade + agemo, data=holzinger.swineford)
psych::mediate(t06_paracomp  ~ grade + (agemo),data = holzinger.raw,std=TRUE)
#show the omega structure of the 24 variables
 om4 <- psych::omega(holzinger.swineford[8:31],4)
psych::omega.diagram(om4,sl=FALSE,main="26 variables from Holzinger-Swineford")

#these data also show an interesting suppression effect

psych::lowerCor(holzinger.swineford[c(3,7,12:14)])
psych::setCor( t06_paracomp ~ grade + agemo, data=holzinger.swineford)
#or show as a mediation effect
mod <- psych::mediate(t06_paracomp  ~ grade + (agemo),data = holzinger.raw,std=TRUE,n.iter=50)
summary(mod)

#now, show a plot of these effets
plot(t07_sentcomp ~ agemo, col=c("red","blue")[holzinger.swineford$grade -6],
  pch=26-holzinger.swineford$grade,data=holzinger.swineford,
   ylab="Sentence Comprehension",xlab="Age in Months",
   main="Sentence Comprehension varies by age and grade")
by(holzinger.swineford,holzinger.swineford$grade -6,function(x) abline(
     lm(t07_sentcomp ~ agemo,data=x),lty=c("dashed","solid")[x$grade-6]))
text(190,3.3,"grade = 8")
text(190,2,"grade = 7")
```

`income` *US family income from US census 2008*

Description

US census data on family income from 2008

Usage

```
data(income)
```

Format

A data frame with 44 observations on the following 4 variables.

`value` lower boundary of the income group

`count` Number of families within that income group

`mean` Mean of the category

`prop` proportion of families

Details

The distribution of income is a nice example of a log normal distribution. It is also an interesting example of the power of graphics. It is quite clear when graphing the data that income statistics are bunched to the nearest 5K. That is, there is a clear sawtooth pattern in the data.

The all.income set is interpolates intervening values for 100-150K, 150-200K and 200-250K

Source

US Census: Table HINC-06. Income Distribution to $250,000 or More for Households: 2008

https://www.census.gov/hhes/www/cpstables/032009/hhinc/new06_000.htm

Examples

```
data(income)
with(income[1:40,], plot(mean,prop, main="US family income for 2008",xlab="income",
        ylab="Proportion of families",xlim=c(0,100000)))
with (income[1:40,], points(lowess(mean,prop,f=.3),typ="l"))
psych::describe(income)


with(all.income, plot(mean,prop, main="US family income for 2008",xlab="income",
                ylab="Proportion of families",xlim=c(0,250000)))
with (all.income[1:50,], points(lowess(mean,prop,f=.25),typ="l"))
```

`iqitems` *16 multiple choice IQ items*

Description

16 multiple choice ability items taken from the Synthetic Aperture Personality Assessment (SAPA) web based personality assessment project. The data from 1525 subjects are included here as a demonstration set for scoring multiple choice inventories and doing basic item statistics. For more information on the development of an open source measure of cognitive ability, consult the readings available at the https://personality-project.org/.

Usage

```
data(iqitems)
```

Format

A data frame with 1525 observations on the following 16 variables. The number following the name is the item number from SAPA.

`reason.4` Basic reasoning questions

`reason.16` Basic reasoning question

`reason.17` Basic reasoning question

`reason.19` Basic reasoning question

`letter.7` In the following alphanumeric series, what letter comes next?

`letter.33` In the following alphanumeric series, what letter comes next?

`letter.34` In the following alphanumeric series, what letter comes next

`letter.58` In the following alphanumeric series, what letter comes next?

`matrix.45` A matrix reasoning task

`matrix.46` A matrix reasoning task

`matrix.47` A matrix reasoning task

`matrix.55` A matrix reasoning task

`rotate.3` Spatial Rotation of type 1.2

`rotate.4` Spatial Rotation of type 1.2

`rotate.6` Spatial Rotation of type 1.1

`rotate.8` Spatial Rotation of type 2.3

Details

16 items were sampled from 80 items given as part of the SAPA (https://www.sapa-project.org/) project (Revelle, Wilt and Rosenthal, 2009; Condon and Revelle, 2014) to develop online measures of ability. These 16 items reflect four lower order factors (verbal reasoning, letter series, matrix reasoning, and spatial rotations. These lower level factors all share a higher level factor ('g'). Similar data are available from the International Cognitive Abiity Resource at https://www.icar-project.org/ .

This data set and the associated data set (`ability` based upon scoring these multiple choice items and converting them to correct/incorrect may be used to demonstrate item response functions, `tetrachoric` correlations, or `irt.fa` as well as `omega` estimates of of reliability and hierarchical structure.

In addition, the data set is a good example of doing item analysis to examine the empirical response probabilities of each item alternative as a function of the underlying latent trait. When doing this, it appears that two of the matrix reasoning problems do not have monotonically increasing trace lines for the probability correct. At moderately high ability (theta = 1) there is a decrease in the probability correct from theta = 0 and theta = 2.

Source

The example data set is taken from the Synthetic Aperture Personality Assessment personality and ability test at https://www.sapa-project.org/. The data were collected with David Condon from 8/08/12 to 8/31/12.

References

Condon, David and Revelle, William, (2014) The International Cognitive Ability Resource: Development and initial validation of a public-domain measure. Intelligence, 43, 52-64.

Revelle, W., Wilt, J., and Rosenthal, A. (2010) Individual Differences in Cognition: New Methods for examining the Personality-Cognition Link In Gruszka, A. and Matthews, G. and Szymura, B. (Eds.) Handbook of Individual Differences in Cognition: Attention, Memory and Executive Control, Springer.

Revelle, W, Condon, D.M., Wilt, J., French, J.A., Brown, A., and Elleman, L.G. (2016) Web and phone based data collection using planned missing designs. In Fielding, N.G., Lee, R.M. and Blank, G. (Eds). SAGE Handbook of Online Research Methods (2nd Ed), Sage Publcations.

Examples

```
data(iqitems)
iq.keys <- c(4,4,4, 6,  6,3,4,4,   5,2,2,4,   3,2,6,7)
psych::score.multiple.choice(iq.keys,iqitems)   #this just gives summary statisics
#convert them to true false
iq.scrub <- psych::scrub(iqitems,isvalue=0)  #first get rid of the zero responses
iq.tf <-  psych::score.multiple.choice(iq.keys,iq.scrub,score=FALSE)
             #convert to wrong (0) and correct (1) for analysis
psych::describe(iq.tf)
#see the ability data set for these analyses
#now, for some item analysis
```

```
iq.irt <- psych::irt.fa(iq.tf)  #do a basic irt
iq.sc <- psych::scoreIrt(iq.irt,iq.tf)  #find the scores
op <- par(mfrow=c(4,4))
psych::irt.responses(iq.sc[,1], iq.tf)
op <- par(mfrow=c(1,1))
```

---

msq — *75 mood items from the Motivational State Questionnaire for 3896 participants*

Description

Emotions may be described either as discrete emotions or in dimensional terms. The Motivational State Questionnaire (MSQ) was developed to study emotions in laboratory and field settings. The data can be well described in terms of a two dimensional solution of energy vs tiredness and tension versus calmness. Additional items include what time of day the data were collected and a few personality questionnaire scores.

Usage

```
data(msq)
```

Format

A data frame with 3896 observations on the following 92 variables.

`active` a numeric vector

`afraid` a numeric vector

`alert` a numeric vector

`angry` a numeric vector

`anxious` a numeric vector

`aroused` a numeric vector

`ashamed` a numeric vector

`astonished` a numeric vector

`at.ease` a numeric vector

`at.rest` a numeric vector

`attentive` a numeric vector

`blue` a numeric vector

`bored` a numeric vector

`calm` a numeric vector

`cheerful` a numeric vector

`clutched.up` a numeric vector

`confident` a numeric vector

`content` a numeric vector

`delighted` a numeric vector

`depressed` a numeric vector

`determined` a numeric vector

`distressed` a numeric vector

`drowsy` a numeric vector

`dull` a numeric vector

`elated` a numeric vector

`energetic` a numeric vector

`enthusiastic` a numeric vector

`excited` a numeric vector

`fearful` a numeric vector

`frustrated` a numeric vector

`full.of.pep` a numeric vector

`gloomy` a numeric vector

`grouchy` a numeric vector

`guilty` a numeric vector

`happy` a numeric vector

`hostile` a numeric vector

`idle` a numeric vector

`inactive` a numeric vector

`inspired` a numeric vector

`intense` a numeric vector

`interested` a numeric vector

`irritable` a numeric vector

`jittery` a numeric vector

`lively` a numeric vector

`lonely` a numeric vector

`nervous` a numeric vector

`placid` a numeric vector

`pleased` a numeric vector

`proud` a numeric vector

`quiescent` a numeric vector

`quiet` a numeric vector

`relaxed` a numeric vector

`sad` a numeric vector

satisfied a numeric vector
scared a numeric vector
serene a numeric vector
sleepy a numeric vector
sluggish a numeric vector
sociable a numeric vector
sorry a numeric vector
still a numeric vector
strong a numeric vector
surprised a numeric vector
tense a numeric vector
tired a numeric vector
tranquil a numeric vector
unhappy a numeric vector
upset a numeric vector
vigorous a numeric vector
wakeful a numeric vector
warmhearted a numeric vector
wide.awake a numeric vector
alone a numeric vector
kindly a numeric vector
scornful a numeric vector
EA Thayer's Energetic Arousal Scale
TA Thayer's Tense Arousal Scale
PA Positive Affect scale
NegAff Negative Affect scale
Extraversion Extraversion from the Eysenck Personality Inventory
Neuroticism Neuroticism from the Eysenck Personality Inventory
Lie Lie from the EPI
Sociability The sociability subset of the Extraversion Scale
Impulsivity The impulsivity subset of the Extraversions Scale
MSQ_Time Time of day the data were collected
MSQ_Round Rounded time of day
TOD a numeric vector
TOD24 a numeric vector
ID subject ID
condition What was the experimental condition after the msq was given
scale a factor with levels msq r original or revised msq
exper Which study were the data collected: a factor with levels AGES BING BORN CART CITY COPE EMIT FAST Fern FILM FLAT Gray imps item knob MAPS mite pat-1 pat-2 PATS post RAFT Rim.1 Rim.2 rob-1 rob-2 ROG1 ROG2 SALT sam-1 sam-2 SAVE/PATS sett swam swam-2 TIME VALE-1 VALE-2 VIEW

Details

The Motivational States Questionnaire (MSQ) is composed of 72 items, which represent the full affective space (Revelle & Anderson, 1998). The MSQ consists of 20 items taken from the Activation-Deactivation Adjective Check List (Thayer, 1986), 18 from the Positive and Negative Affect Schedule (PANAS, Watson, Clark, & Tellegen, 1988) along with the items used by Larsen and Diener (1992). The response format was a four-point scale that corresponds to Russell and Carroll's (1999) "ambiguous–likely-unipolar format" and that asks the respondents to indicate their current standing ("at this moment") with the following rating scale:
0—————-1—————-2—————-3
Not at all A little Moderately Very much

The original version of the MSQ included 70 items. Intermediate analyses (done with 1840 subjects) demonstrated a concentration of items in some sections of the two dimensional space, and a paucity of items in others. To begin correcting this, 3 items from redundantly measured sections (alone, kindly, scornful) were removed, and 5 new ones (anxious, cheerful, idle, inactive, and tranquil) were added. Thus, the correlation matrix is missing the correlations between items anxious, cheerful, idle, inactive, and tranquil with alone, kindly, and scornful.

Procedure. The data were collected over nine years, as part of a series of studies examining the effects of personality and situational factors on motivational state and subsequent cognitive performance. In each of 38 studies, prior to any manipulation of motivational state, participants signed a consent form and filled out the MSQ. (The procedures of the individual studies are irrelevant to this data set and could not affect the responses to the MSQ, since this instrument was completed before any further instructions or tasks). Some MSQ post test (after manipulations) is available in `affect`.

The EA and TA scales are from Thayer, the PA and NA scales are from Watson et al. (1988). Scales and items:

Energetic Arousal: active, energetic, vigorous, wakeful, wide.awake, full.of.pep, lively, -sleepy, -tired, - drowsy (ADACL)

Tense Arousal: Intense, Jittery, fearful, tense, clutched up, -quiet, -still, - placid, - calm, -at rest (ADACL)

Positive Affect: active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, strong (PANAS)

Negative Affect: afraid, ashamed, distressed, guilty, hostile, irritable , jittery, nervous, scared, upset (PANAS)

The PA and NA scales can in turn can be thought of as having subscales: (See the PANAS-X) Fear: afraid, scared, nervous, jittery (not included frightened, shaky) Hostility: angry, hostile, irritable, (not included: scornful, disgusted, loathing guilt: ashamed, guilty, (not included: blameworthy, angry at self, disgusted with self, dissatisfied with self) sadness: alone, blue, lonely, sad, (not included: downhearted) joviality: cheerful, delighted, energetic, enthusiastic, excited, happy, lively, (not included: joyful) self-assurance: proud, strong, confident, (not included: bold, daring, fearless) attentiveness: alert, attentive, determined (not included: concentrating)

The next set of circumplex scales were taken (I think) from Larsen and Diener (1992). High activation: active, aroused, surprised, intense, astonished Activated PA: elated, excited, enthusiastic, lively Unactivated NA : calm, serene, relaxed, at rest, content, at ease PA: happy, warmhearted, pleased, cheerful, delighted Low Activation: quiet, inactive, idle, still, tranquil Unactivated PA:

dull, bored, sluggish, tired, drowsy NA: sad, blue, unhappy, gloomy, grouchy Activated NA: jittery, anxious, nervous, fearful, distressed.

Keys for these separate scales are shown in the examples.

In addition to the MSQ, there are 5 scales from the Eysenck Personality Inventory (Extraversion, Impulsivity, Sociability, Neuroticism, Lie). The Imp and Soc are subsets of the the total extraversion scale.

Source

Data collected at the Personality, Motivation, and Cognition Laboratory, Northwestern University.

References

Larsen, R. J., & Diener, E. (1992). Promises and problems with the circumplex model of emotion. In M. S. Clark (Ed.), Review of personality and social psychology, No. 13. Emotion (pp. 25-59). Thousand Oaks, CA, US: Sage Publications, Inc.

Rafaeli, Eshkol and Revelle, William (2006), A premature consensus: Are happiness and sadness truly opposite affects? Motivation and Emotion, 30, 1, 1-12.

Revelle, W. and Anderson, K.J. (1998) Personality, motivation and cognitive performance: Final report to the Army Research Institute on contract MDA 903-93-K-0008. (https://www.personality-project.org/revelle/publications/ra.ari.98.pdf).

Thayer, R.E. (1989) The biopsychology of mood and arousal. Oxford University Press. New York, NY.

Watson,D., Clark, L.A. and Tellegen, A. (1988) Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology, 54(6):1063-1070.

See Also

msqR for a larger data set with repeated measures for 3032 participants measured at least once, 2753 measured twice, 446 three times and 181 four times. affect for an example of the use of some of these adjectives in a mood manipulation study.

make.keys, scoreItems and scoreOverlap for instructions on how to score multiple scales with and without item overlap. Also see fa and fa.extension for instructions on how to do factor analyses or factor extension.

Examples

```
data(msq)
   #in in the interests of time
#basic descriptive statistics
psych::describe(msq)

#score them for 20 short scales -- note that these have item overlap
#The first 2 are from Thayer
#The next 2 are classic positive and negative affect
#The next 9 are circumplex scales
#the last 7 are msq estimates of PANASX scales (missing some items)
```

```
keys.list <- list(
EA = c("active", "energetic", "vigorous", "wakeful", "wide.awake", "full.of.pep",
       "lively", "-sleepy", "-tired", "-drowsy"),
TA =c("intense", "jittery", "fearful", "tense", "clutched.up", "-quiet", "-still",
       "-placid", "-calm", "-at.rest") ,
PA =c("active", "excited", "strong", "inspired", "determined", "attentive",
          "interested", "enthusiastic", "proud", "alert"),
NAf =c("jittery", "nervous", "scared", "afraid", "guilty", "ashamed", "distressed",
         "upset", "hostile", "irritable" ),
HAct = c("active", "aroused", "surprised", "intense", "astonished"),
aPA = c("elated", "excited", "enthusiastic", "lively"),
uNA = c("calm", "serene", "relaxed", "at.rest", "content", "at.ease"),
pa = c("happy", "warmhearted", "pleased", "cheerful", "delighted" ),
LAct = c("quiet", "inactive", "idle", "still", "tranquil"),
uPA =c( "dull", "bored", "sluggish", "tired", "drowsy"),
naf = c( "sad", "blue", "unhappy", "gloomy", "grouchy"),
aNA = c("jittery", "anxious", "nervous", "fearful", "distressed"),
Fear = c("afraid" , "scared" , "nervous" , "jittery" ) ,
Hostility = c("angry" ,  "hostile", "irritable", "scornful" ),
Guilt = c("guilty" , "ashamed" ),
Sadness = c( "sad"  , "blue" , "lonely",  "alone" ),
Joviality =c("happy","delighted", "cheerful", "excited", "enthusiastic", "lively", "energetic"),
Self.Assurance=c( "proud","strong" , "confident" , "-fearful" ),
Attentiveness = c("alert" , "determined" , "attentive" )
#, acquiscence = c("sleepy" ,  "wakeful" ,  "relaxed","tense")
#dropped because it has a negative alpha and throws warnings
   )

msq.scores <- psych::scoreItems(keys.list,msq)

#show a circumplex structure for the non-overlapping items
fcirc <- psych::fa(msq.scores$scores[,5:12],2)
psych::fa.plot(fcirc,labels=colnames(msq.scores$scores)[5:12])

#now, find the correlations corrected for item overlap
msq.overlap <- psych::scoreOverlap(keys.list,msq)
#a warning is thrown by smc  because of some NAs in the matrix

f2 <- psych::fa(msq.overlap$cor,2)
psych::fa.plot(f2,labels=colnames(msq.overlap$cor),
      title="2 dimensions of affect, corrected for overlap")

#extend this solution to EA/TA  NA/PA space
fe  <- psych::fa.extension(cor(msq.scores$scores[,5:12],msq.scores$scores[,1:4]),fcirc)
psych::fa.diagram(fcirc,fe=fe,
          main="Extending the circumplex structure to  EA/TA and PA/NA ")

#show the 2 dimensional structure
f2 <- psych::fa(msq[1:72],2)
psych::fa.plot(f2,labels=colnames(msq)[1:72],
     title="2 dimensions of affect at the item level",cex=.5)

#sort them by polar coordinates
```

```
round(psych::polar(f2),2)
```

msqR — *75 mood items from the Motivational State Questionnaire for 3032 unique participants*

Description

Emotions may be described either as discrete emotions or in dimensional terms. The Motivational State Questionnaire (MSQ) was developed to study emotions in laboratory and field settings. The data can be well described in terms of a two dimensional solution of energy vs tiredness and tension versus calmness. Alternatively, this space can be organized by the two dimensions of Positive Affect and Negative Affect. Additional items include what time of day the data were collected and a few personality questionnaire scores. 3032 unique participants took the MSQ at least once, 2753 at least twice, 446 three times, and 181 four times. The 3032 participants also took the `sai` state anxiety inventory at the same time. Some studies manipulated arousal by caffeine, others manipulations included affect inducing movies.

Usage

```
data("msqR")
```

Format

A data frame with 6411 observations on the following 88 variables.

`active` a numeric vector

`afraid` a numeric vector

`alert` a numeric vector

`alone` a numeric vector

`angry` a numeric vector

`aroused` a numeric vector

`ashamed` a numeric vector

`astonished` a numeric vector

`at.ease` a numeric vector

`at.rest` a numeric vector

`attentive` a numeric vector

`blue` a numeric vector

`bored` a numeric vector

`calm` a numeric vector

`clutched.up` a numeric vector

`confident` a numeric vector

`content` a numeric vector

`delighted` a numeric vector

`depressed` a numeric vector

`determined` a numeric vector

`distressed` a numeric vector

`drowsy` a numeric vector

`dull` a numeric vector

`elated` a numeric vector

`energetic` a numeric vector

`enthusiastic` a numeric vector

`excited` a numeric vector

`fearful` a numeric vector

`frustrated` a numeric vector

`full.of.pep` a numeric vector

`gloomy` a numeric vector

`grouchy` a numeric vector

`guilty` a numeric vector

`happy` a numeric vector

`hostile` a numeric vector

`inspired` a numeric vector

`intense` a numeric vector

`interested` a numeric vector

`irritable` a numeric vector

`jittery` a numeric vector

`lively` a numeric vector

`lonely` a numeric vector

`nervous` a numeric vector

`placid` a numeric vector

`pleased` a numeric vector

`proud` a numeric vector

`quiescent` a numeric vector

`quiet` a numeric vector

`relaxed` a numeric vector

`sad` a numeric vector

`satisfied` a numeric vector

`scared` a numeric vector

`serene` a numeric vector

`sleepy` a numeric vector

`sluggish` a numeric vector

`sociable` a numeric vector

`sorry` a numeric vector

`still` a numeric vector

`strong` a numeric vector

`surprised` a numeric vector

`tense` a numeric vector

`tired` a numeric vector

`unhappy` a numeric vector

`upset` a numeric vector

`vigorous` a numeric vector

`wakeful` a numeric vector

`warmhearted` a numeric vector

`wide.awake` a numeric vector

`anxious` a numeric vector

`cheerful` a numeric vector

`idle` a numeric vector

`inactive` a numeric vector

`tranquil` a numeric vector

`kindly` a numeric vector

`scornful` a numeric vector

`Extraversion` Extraversion from the EPI

`Neuroticism` Neuroticism from the EPI

`Lie` Lie from the EPI

`Sociability` Sociability from the EPI

`Impulsivity` Impulsivity from the EPI

`gender` 1= male, 2 = female (coded on presumed x chromosome). Slowly being added to the data set.

`TOD` Time of day that the study was run

`drug` 1 if given placebo, 2 if given caffeine

`film` 1-4 if given a film: 1=Frontline, 2= Halloween, 3=Serengeti, 4 = Parenthood

`time` Measurement occasion (1 and 2 are same session, 3 and 4 are the same, but a later session)

`id` a numeric vector

`form` msq versus msqR

`study` a character vector of the experiment name

Details

The Motivational States Questionnaire (MSQ) is composed of 75 items, which represent the full affective space (Revelle & Anderson, 1998). The MSQ consists of 20 items taken from the Activation-Deactivation Adjective Check List (Thayer, 1986), 18 from the Positive and Negative Affect Schedule (PANAS, Watson, Clark, & Tellegen, 1988) along with the affective circumplex items used by Larsen and Diener (1992). The response format was a four-point scale that corresponds to Russell and Carroll's (1999) "ambiguous–likely-unipolar format" and that asks the respondents to indicate their current standing ("at this moment") with the following rating scale:
0—————-1—————-2—————-3
Not at all A little Moderately Very much

The original version of the MSQ included 70 items. Intermediate analyses (done with 1840 subjects) demonstrated a concentration of items in some sections of the two dimensional space, and a paucity of items in others. To begin correcting this, 3 items from redundantly measured sections (alone, kindly, scornful) were removed, and 5 new ones (anxious, cheerful, idle, inactive, and tranquil) were added. Thus, the correlation matrix is missing the correlations between items anxious, cheerful, idle, inactive, and tranquil with alone, kindly, and scornful.

2605 individuals took Form 1 version, 3806 the Form 2 version. 3032 people (1218 form 1, 1814 form 2) took the MSQ at least once. 2086 at least twice, 1112 three times, and 181 four times.

To see the relative frequencies by time and form, see the first example.

Procedure. The data were collected over nine years in the Personality, Motivation and Cognition laboratory at Northwestern, as part of a series of studies examining the effects of personality and situational factors on motivational state and subsequent cognitive performance. In each of 38 studies, prior to any manipulation of motivational state, participants signed a consent form and in some studies, consumed 0 or 4mg/kg of caffeine. In caffeine studies, they waited 30 minutes and then filled out the MSQ. (Normally, the procedures of the individual studies are irrelevant to this data set and could not affect the responses to the MSQ at time 1, since this instrument was completed before any further instructions or tasks. However, caffeine does have an effect.) The MSQ post test following a movie manipulation) is available in `affect` as well as here.

The XRAY study crossed four movie conditions with caffeine. The first MSQ measures are showing the effects of the movies and caffeine, but after an additional 30 minutes, the second MSQ seems to mainly show the caffeine effects. The movies were 9 minute clips from 1) a BBC documentary on British troops arriving at the Bergen-Belsen concentration camp (sad); 2) an early scene from Halloween in which the heroine runs around shutting doors and windows (terror); 3) a documentary about lions on the Serengeti plain, and 4) the "birthday party" scene from Parenthood.

The FLAT study measured affect before, immediately after, and then after 30 minutes following a movie manipulation. See the `affect` data set.

To see which studies used which conditions, see the second and third examples.

The EA and TA scales are from Thayer, the PA and NA scales are from Watson et al. (1988). Scales and items:

Energetic Arousal: active, energetic, vigorous, wakeful, wide.awake, full.of.pep, lively, -sleepy, -tired, - drowsy (ADACL)

Tense Arousal: Intense, Jittery, fearful, tense, clutched up, -quiet, -still, - placid, - calm, -at rest (ADACL)

Positive Affect: active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, strong (PANAS)

Negative Affect: afraid, ashamed, distressed, guilty, hostile, irritable , jittery, nervous, scared, upset (PANAS)

The PA and NA scales can in turn can be thought of as having subscales: (See the PANAS-X) Fear: afraid, scared, nervous, jittery (not included frightened, shaky) Hostility: angry, hostile, irritable, (not included: scornful, disgusted, loathing guilt: ashamed, guilty, (not included: blameworthy, angry at self, disgusted with self, dissatisfied with self) sadness: alone, blue, lonely, sad, (not included: downhearted) joviality: cheerful, delighted, energetic, enthusiastic, excited, happy, lively, (not included: joyful) self-assurance: proud, strong, confident, (not included: bold, daring, fearless) attentiveness: alert, attentive, determined (not included: concentrating)

The next set of circumplex scales were taken from Larsen and Diener (1992). High activation: active, aroused, surprised, intense, astonished Activated PA: elated, excited, enthusiastic, lively Unactivated NA : calm, serene, relaxed, at rest, content, at ease PA: happy, warmhearted, pleased, cheerful, delighted Low Activation: quiet, inactive, idle, still, tranquil Unactivated PA: dull, bored, sluggish, tired, drowsy NA: sad, blue, unhappy, gloomy, grouchy Activated NA: jittery, anxious, nervous, fearful, distressed.

Keys for these separate scales are shown in the examples.

In addition to the MSQ, there are 5 scales from the Eysenck Personality Inventory (Extraversion, Impulsivity, Sociability, Neuroticism, Lie). The Imp and Soc are subsets of the the total extraversion scale based upon a reanalysis of the EPI by Rocklin and Revelle (1983). This information is in the `msq` data set as well.

Note

In December, 2018 the caffeine, film and personality conditions were added. In the process of doing so, it was discovered that the EMIT data had been incorrectly entered. This has been fixed.

Source

Data collected at the Personality, Motivation, and Cognition Laboratory, Northwestern University.

References

Larsen, R. J., & Diener, E. (1992). Promises and problems with the circumplex model of emotion. In M. S. Clark (Ed.), Review of personality and social psychology, No. 13. Emotion (pp. 25-59). Thousand Oaks, CA, US: Sage Publications, Inc.

Rafaeli, Eshkol and Revelle, William (2006), A premature consensus: Are happiness and sadness truly opposite affects? Motivation and Emotion, 30, 1, 1-12.

Revelle, W. and Anderson, K.J. (1998) Personality, motivation and cognitive performance: Final report to the Army Research Institute on contract MDA 903-93-K-0008. (https://www.personality-project.org/revelle/publications/ra.ari.98.pdf).

Smillie, Luke D. and Cooper, Andrew and Wilt, Joshua and Revelle, William (2012) Do Extraverts Get More Bang for the Buck? Refining the Affective-Reactivity Hypothesis of Extraversion. Journal of Personality and Social Psychology, 103 (2), 206-326.

Thayer, R.E. (1989) The biopsychology of mood and arousal. Oxford University Press. New York, NY.

Watson,D., Clark, L.A. and Tellegen, A. (1988) Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology, 54(6):1063-1070.

See Also

msq for 3896 participants with scores on five scales of the EPI. affect for an example of the use of some of these adjectives in a mood manipulation study.

make.keys, scoreItems and scoreOverlap for instructions on how to score multiple scales with and without item overlap. Also see fa and fa.extension for instructions on how to do factor analyses or factor extension.

Given the temporal ordering of the sai data and the msqR data, these data are useful for demonstrations of testRetest reliability. See the examples in testRetest for how to combine the sai tai and msqR datasets.

Examples

```
data(msqR)
table(msqR$form,msqR$time) #which forms?
table(msqR$study,msqR$drug) #Drug studies
table(msqR$study,msqR$film) #Film studies
table(msqR$study,msqR$TOD) #To examine time of day


#score them for 20 short scales -- note that these have item overlap
#The first 2 are from Thayer
#The next 2 are classic positive and negative affect
#The next 9 are circumplex scales
#the last 7 are msq estimates of PANASX scales (missing some items)
keys.list <- list(
EA = c("active", "energetic", "vigorous", "wakeful", "wide.awake", "full.of.pep",
       "lively", "-sleepy", "-tired", "-drowsy"),
TA =c("intense", "jittery", "fearful", "tense", "clutched.up", "-quiet", "-still",
       "-placid", "-calm", "-at.rest") ,
PA =c("active", "excited", "strong", "inspired", "determined", "attentive",
          "interested", "enthusiastic", "proud", "alert"),
NAf =c("jittery", "nervous", "scared", "afraid", "guilty", "ashamed", "distressed",
         "upset", "hostile", "irritable" ),
HAct = c("active", "aroused", "surprised", "intense", "astonished"),
aPA = c("elated", "excited", "enthusiastic", "lively"),
uNA = c("calm", "serene", "relaxed", "at.rest", "content", "at.ease"),
pa = c("happy", "warmhearted", "pleased", "cheerful", "delighted" ),
LAct = c("quiet", "inactive", "idle", "still", "tranquil"),
uPA =c( "dull", "bored", "sluggish", "tired", "drowsy"),
naf = c( "sad", "blue", "unhappy", "gloomy", "grouchy"),
aNA = c("jittery", "anxious", "nervous", "fearful", "distressed"),
Fear = c("afraid" , "scared" , "nervous" , "jittery" ) ,
Hostility = c("angry" ,  "hostile", "irritable", "scornful" ),
Guilt = c("guilty" , "ashamed" ),
Sadness = c( "sad"  , "blue" , "lonely",  "alone" ),
Joviality =c("happy","delighted", "cheerful", "excited", "enthusiastic", "lively", "energetic"),
```

```
Self.Assurance=c( "proud","strong" , "confident" , "-fearful" ),
Attentiveness = c("alert" , "determined" , "attentive" ))

#acquiscence = c("sleepy" ,  "wakeful" ,  "relaxed","tense")
#Yik Russell and Steiger list the following items
Yik.keys <- list(
pleasure =psych::cs(happy,content,satisfied, pleased),
act.pleasure =psych::cs(proud,enthusiastic,euphoric),
pleasant.activation = psych::cs(energetic,full.of.pep,excited,wakeful,attentive,
   wide.awake,active,alert,vigorous),
activation = psych::cs(aroused,hyperactivated,intense),
unpleasant.act = psych::cs(anxious,frenzied,jittery,nervous),
activated.displeasure =psych::cs(scared,upset,shaky,fearful,clutched.up,tense,
    ashamed,guilty,agitated,hostile),
displeaure =psych::cs(troubled,miserable,unhappy,dissatisfied),
Ueactivated.Displeasure = psych::cs(sad,down,gloomy,blue,melancholy),
Unpleasant.Deactivation = psych::cs(droopy,drowsy,dull,bored,sluggish,tired),
Deactivation =psych::cs( quiet,still),
pleasant.deactivation = psych::cs(placid,relaxed,tranquil, at.rest,calm),
deactived.pleasure =psych::cs( serene,soothed,peaceful,at.ease,secure)
)

#of these 60 items, 46 appear in the msqR
Yik.msq.keys <- list(
Pleasure =psych::cs(happy,content,satisfied, pleased),
Activated.Pleasure =psych::cs(proud,enthusiastic),
Pleasant.Activation = psych::cs(energetic,full.of.pep,excited,wakeful,attentive,
    wide.awake,active,alert,vigorous),
Activation = psych::cs(aroused,intense),
Unpleasant.Activation = psych::cs(anxious,jittery,nervous),
Activated.Displeasure =psych::cs(scared,upset,fearful,
          clutched.up,tense,ashamed,guilty,hostile),
Displeasure = psych::cs(unhappy),
Deactivated.Displeasure = psych::cs(sad,gloomy,blue),
Unpleasant.Deactivation = psych::cs(drowsy,dull,bored,sluggish,tired),
Deactivation =psych::cs( quiet,still),
Pleasant.Deactivation = psych::cs(placid,relaxed,tranquil, at.rest,calm),
Deactivated.Pleasure =psych::cs( serene,at.ease)
)
yik.scores <- psych::scoreItems(Yik.msq.keys,msqR)
yik <- yik.scores$scores
f2.yik <- psych::fa(yik,2) #factor the yik scores
psych::fa.plot(f2.yik,labels=colnames(yik),title="Yik-Russell-Steiger circumplex",cex=.8,
      pos=(c(1,1,2,1,1,1,3,1,4,1,2,4)))


msq.scores <- psych::scoreItems(keys.list,msqR)

#show a circumplex structure for the non-overlapping items
fcirc <- psych::fa(msq.scores$scores[,5:12],2)
psych::fa.plot(fcirc,labels=colnames(msq.scores$scores)[5:12])
```

```
#now, find the correlations corrected for item overlap
msq.overlap <- psych::scoreOverlap(keys.list,msqR)
f2 <- psych::fa(msq.overlap$cor,2)
psych::fa.plot(f2,labels=colnames(msq.overlap$cor),
          title="2 dimensions of affect, corrected for overlap")

#extend this solution to EA/TA  NA/PA space
fe  <- psych::fa.extension(cor(msq.scores$scores[,5:12],msq.scores$scores[,1:4]),fcirc)
psych::fa.diagram(fcirc,fe=fe,main="Extending the circumplex structure to  EA/TA and PA/NA ")

#show the 2 dimensional structure
f2 <- psych::fa(msqR[1:72],2)
psych::fa.plot(f2,labels=colnames(msqR)[1:72],title="2 dimensions of affect at the item level")

#sort them by polar coordinates
round(psych::polar(f2),2)

#the msqR and sai data sets have 10 overlapping items which can be used for
#testRetest analysis.  We need to specify the keys, and then choose the appropriate
#data sets
sai.msq.keys <- list(pos =c( "at.ease" ,  "calm" , "confident", "content","relaxed"),
  neg = c("anxious", "jittery", "nervous" ,"tense"   ,   "upset"),
  anx = c("anxious", "jittery", "nervous" ,"tense", "upset","-at.ease" ,  "-calm" ,
  "-confident", "-content","-relaxed"))

select <- psych::selectFromKeys(sai.msq.keys$anx)
#The following is useful for examining test retest reliabilities
msq.control <- subset(msqR,is.element( msqR$study , c("Cart", "Fast", "SHED", "SHOP")))
msq.film <- subset(msqR,(is.element( msqR$study ,  c("FIAT", "FILM","FLAT","MIXX","XRAY"))
    & (msqR$time < 3) ))

msq.film[((msq.film$study == "FLAT") & (msq.film$time ==3)) ,] <- NA
msq.drug <- subset(msqR,(is.element( msqR$study ,  c("AGES","SALT", "VALE", "XRAY")))
   &(msqR$time < 3))

msq.day <- subset(msqR,is.element( msqR$study ,  c("SAM", "RIM")))
```

---

neo *NEO correlation matrix from the NEO_PI_R manual*

Description

The NEO.PI.R is a widely used personality test to assess 5 broad factors (Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness) with six facet scales for each factor. The correlation matrix of the facets is reported in the NEO.PI.R manual for 1000 subjects.

Usage

```
data(neo)
```

Format

A data frame of a 30 x 30 correlation matrix with the following 30 variables.

N1 Anxiety

N2 AngryHostility

N3 Depression

N4 Self-Consciousness

N5 Impulsiveness

N6 Vulnerability

E1 Warmth

E2 Gregariousness

E3 Assertiveness

E4 Activity

E5 Excitement-Seeking

E6 PositiveEmotions

O1 Fantasy

O2 Aesthetics

O3 Feelings

O4 Ideas

O5 Actions

O6 Values

A1 Trust

A2 Straightforwardness

A3 Altruism

A4 Compliance

A5 Modesty

A6 Tender-Mindedness

C1 Competence

C2 Order

C3 Dutifulness

C4 AchievementStriving

C5 Self-Discipline

C6 Deliberation

Details

The past thirty years of personality research has led to a general consensus on the identification of major dimensions of personality. Variously known as the “Big 5" or the “Five Factor Model", the general solution represents 5 broad domains of personal and interpersonal experience. Neuroticism and Extraversion are thought to reflect sensitivity to negative and positive cues from the environment and the tendency to withdraw or approach. Openness is sometimes labeled as Intellect and reflects an interest in new ideas and experiences. Agreeableness and Conscientiousness reflect tendencies to get along with others and to want to get ahead.

The factor structure of the NEO suggests five correlated factors as well as two higher level factors. The NEO was constructed with 6 “facets" for each of the five broad factors.

For a contrasting structure, examine the items of the `link{spi}` data set (Condon, 2017).

Source

Costa, Paul T. and McCrae, Robert R. (1992) (NEO PI-R) professional manual. Psychological Assessment Resources, Inc. Odessa, FL. (with permission of the author and the publisher)

References

Condon, D. (2017) The SAPA Personality Inventory:An empirically-derived, hierarchically-organized self-report personality assessment model

Digman, John M. (1990) Personality structure: Emergence of the five-factor model. Annual Review of Psychology. 41, 417-440.

John M. Digman (1997) Higher-order factors of the Big Five. Journal of Personality and Social Psychology, 73, 1246-1256.

McCrae, Robert R. and Costa, Paul T., Jr. (1999) A Five-Factor theory of personality. In Pervin, Lawrence A. and John, Oliver P. (eds) Handbook of personality: Theory and research (2nd ed.) 139-153. Guilford Press, New York. N.Y.

Revelle, William (1995), Personality processes, Annual Review of Psychology, 46, 295-328.

Joshua Wilt and William Revelle (2009) Extraversion and Emotional Reactivity. In Mark Leary and Rick H. Hoyle (eds). Handbook of Individual Differences in Social Behavior. Guilford Press, New York, N.Y.

Joshua Wil and William Revelle (2016) Extraversion. In Thomas Widiger (ed) The Oxford Handbook of the Five Factor Model. Oxford University Press.

Examples

```
data(neo)
n5 <- psych::fa(neo,5)
neo.keys <- psych::make.keys(30,list(N=c(1:6),E=c(7:12),O=c(13:18),A=c(19:24),C=c(25:30)))
n5p <- psych::target.rot(n5,neo.keys) #show a targeted rotation for simple structure
n5p
```

peas *Galton's Peas*

Description

Francis Galton introduced the correlation coefficient with an analysis of the similarities of the parent and child generation of 700 sweet peas.

Usage

```
data(peas)
```

Format

A data frame with 700 observations on the following 2 variables.

`parent` The mean diameter of the mother pea for 700 peas

`child` The mean diameter of the daughter pea for 700 sweet peas

Details

Galton's introduction of the correlation coefficient was perhaps the most important contribution to the study of individual differences. This data set allows a graphical analysis of the data set. There are two different graphic examples. One shows the regression lines for both relationships, the other finds the correlation as well.

Source

Stanton, Jeffrey M. (2001) Galton, Pearson, and the Peas: A brief history of linear regression for statistics intstructors, Journal of Statistics Education, 9. (retrieved from the web from https://www.amstat.org/publications/jse reproduces the table from Galton, 1894, Table 2.

The data were generated from this table.

References

Galton, Francis (1877) Typical laws of heredity. paper presented to the weekly evening meeting of the Royal Institution, London. Volume VIII (66) is the first reference to this data set. The data appear in

Galton, Francis (1894) Natural Inheritance (5th Edition), New York: MacMillan).

See Also

The other Galton data sets: `heights`, `galton`,`cubits`

Examples

```
data(peas)
psych::pairs.panels(peas,lm=TRUE,xlim=c(14,22),ylim=c(14,22),main="Galton's Peas")
psych::describe(peas)
psych::pairs.panels(peas,main="Galton's Peas")
```

---

psychTools *psychTools: datasets and utility functions to accompany the psych package*

Description

PsychTools includes the larger data sets used by the psych package and also includes a few general utility functions such as the read.file and read.clipboard functions. The data sets ara made available for demonstrations of a variety of psychometric functions.

Details

See the various helpfiles listed in the index or as links from here. Also see the main functions in the psych package 00.psych-package.

Data sets from the SAPA/ICAR project:

ability	16 ICAR ability items scored as correct or incorrect for 1525 participants.
iqitems	multiple choice IQ items (raw responses)
affect	Two data sets of affect and arousal scores as a function of personality and movie conditions
bfi	25 Personality items representing 5 factors from the SAPA project for 2800 participants
bfi.dictionary	Dictionary of the bfi
epi	Eysenck Personality Inventory (EPI) data for 3570 participants
epi.dictionary	The items for the epi
epi.bfi	13 personality scales from the Eysenck Personality Inventory and Big 5 inventory
epiR	474 participants took the epi twice
msq	75 mood items from the Motivational State Questionnaire for 3896 participants
msqR	75 mood items from the Motivational State Questionnaire for 3032 unique participants
tai	Trait Anxiety data from the PMC lab matching the sai sample. 3032 unique subjects
sai	State Anxiety data from the PMC lab over multiple occasions. 3032 unique subjects.
sai.dictionary	items used in the sai
spi	4000 cases from the SAPA Personality Inventory including an item dictionary and scoring keys.
spi.dictionary	The items for the spi
spi.keys	Scoring keys for the spi

Historically interesting data sets

burt	11 emotional variables from Burt (1915)
galton	Galtons Mid parent child height data
heights	A data.frame of the Galton (1888) height and cubit data set

cubits	Galtons example of the relationship between height and cubit or forearm length
peas	Galtons Peas
cushny	The data set from Cushny and Peebles (1905) on the effect of three drugs on hours of sleep, used by
holzinger.swineford	26 cognitive variables + 7 demographic variables for 301 cases from Holzinger and Swineford.

Miscellaneous example data sets

blant	A 29 x 29 matrix that produces weird factor analytic results
blot	Bonds Logical Operations Test - BLOT
cities	Distances between 11 US cities
city.location	and their geograpical location
income	US family income from US census 2008
all.income	US family income from US census 2008
neo	NEO correlation matrix from the NEO_PI_R manual
Schutz	The Schutz correlation matrix example from Shapiro and ten Berge
Spengler	The Spengler and Damian correlation matrix example from Spengler, Damian and Roberts (2018)
Damian	Another correlation matrix from Spengler, Damian and Roberts (2018)
usaf	A correlation of 17 body size (anthropometric) measures from the US Air Force. Adapted from the Anthropom
veg	Paired comparison of preferences for 9 vegetables (scaling example)

Functions to convert various objects to latex

fa2latex	Convert a data frame, correlation matrix, or factor analysis output to a LaTeX table
df2latex	Convert a data frame, correlation matrix, or factor analysis output to a LaTeX table
ICC2latex	Convert an ICC analyssis output to a LaTeX table
irt2latex	Convert an irt analysis output to a LaTeX table
cor2latex	Convert a correlation matrix output to a LaTeX table
omega2latex	Convert a data frame, correlation matrix, or factor analysis output to a LaTeX table

File manipulation functions

fileCreate	Create a file
fileScan	Show the first few lines of multitple files
filesInfo	Show the information for all files in a directory
filesList	Show the names of all files in a directory

dfOrder Sorts a data frame

File input/output functions

read.clipboard	Shortcuts for reading from the clipboard or a file
read.clipboard.csv	
read.clipboard.fwf	
read.clipboard.lower	
read.clipboard.tab	

read.clipboard.upper	
read.file	Read a file according to its suffix
read.file.csv	
read.https	
write.file	Write data to a file
write.file.csv	

Examples

```
psych::describe(ability)
```

---

read.file *Shortcuts for reading from the clipboard or a file*

Description

Input from a variety of sources may be read. data.frames may be read from files with suffixes of .txt, .text, .TXT, .dat, .DATA,.data, .csv, .rds, rda, .xpt, XPT, or .sav (i.e., data from SPSS sav files may be read as can files saved by SAS using the .xpt option). Data exported by JMP or EXCEL in the csv format are also able to be read. Fixed Width Files saved in .txt mode may be read if the widths parameter is specified. Files saved with writeRDS have suffixes of .rds or Rds, and are read using readRDS. Files associated with objects with suffixes .rda and .Rda are loaded (following a security prompt). The default values for read.spss are adjusted for more standard input from SPSS files. Input from the clipboard is easy but a bit obscure, particularly for Mac users. read.clipboard and its variations are just an easier way to do so. Data may be copied to the clipboard from Excel spreadsheets, csv files, or fixed width formatted files and then into a data.frame. Data may also be read from lower (or upper) triangular matrices and filled out to square matrices. Writing text files may be done using write.file which will prompt for a file name (if not given) and then write or save to that file depending upon the suffix (text, txt, or csv will call write.table, R, or r will dput, rda, Rda will save, Rds,rds will saveRDS).

Usage

```
read.file(file=NULL,header=TRUE,use.value.labels=FALSE,to.data.frame=TRUE,sep=",",
quote="\"", widths=NULL,f=NULL, filetype=NULL,...)
 #for .txt, .text, TXT, .csv, .sav, .xpt, XPT,  R, r, Rds, .rds, or .rda,
# .Rda, .RData, .Rdata, .dat and .DAT  files

read.clipboard(header = TRUE, ...)   #assumes headers and tab or space delimited
read.clipboard.csv(header=TRUE,sep=',',...)  #assumes headers and comma delimited
read.clipboard.tab(header=TRUE,sep='\t',...)  #assumes headers and tab delimited
 #read in a matrix given the lower off diagonal
 read.clipboard.lower(diag=TRUE,names=FALSE,...)
 read.clipboard.upper(diag=TRUE,names=FALSE,...)

#read in data using a fixed format width (see read.fwf for instructions)
```

```
read.clipboard.fwf(header=FALSE,widths=rep(1,10),...)

read.https(filename,header=TRUE)
read.file.csv(file=NULL,header=TRUE,f=NULL,...)

#For output:
write.file(x,file=NULL,row.names=FALSE,f=NULL,...)
write.file.csv(x,file=NULL,row.names=FALSE,f=NULL,...)
```

Arguments

header	Does the first row have variable labels (generally assumed to be TRUE).
sep	What is the designated separater between data fields? For typical csv files, this will be a comma, but if commas designate decimals, then a ; can be used to designate different records.
quote	Specified to
diag	for upper or lower triangular matrices, is the diagonal specified or not
names	for read.clipboard.lower or upper, are colnames in the the first column
widths	how wide are the columns in fixed width input. The default is to read 10 columns of size 1.
filename	Name or address of remote https file to read.
...	Other parameters to pass to read
f	A file name to read from or write to. If omitted, `file.choose` is called to dynamically get the file name.
file	A file name to read from or write to. (same as f, but perhaps more intuitive) If omitted and if f is omitted,then `file.choose` is called to dynamically get the file name.
x	The data frame or matrix to write to f
row.names	Should the output file include the rownames? By default, no.
to.data.frame	Should the spss input be converted to a data frame?
use.value.labels	Should the SPSS input values be converted to numeric?
filetype	If specified the reading will use this term rather than the suffix.

Details

A typical session of R might involve data stored in text files, generated online, etc. Although it is easy to just read from a file (particularly if using `read.file`, an alternative is to use one's local system to copy from the file to the clipboard and then read from the clipboard `read.clipboard`. This is very convenient (and somewhat more intuitive to the naive user). This is particularly convenient when copying from a text book or article and just moving a section of text into R.) However, copying from a file and then reading the clipboard is hard to automate in a script. Thus, coderead.file will read from a file.

The `read.file` function combines the `file.choose` and either `read.table`, `read.fwf`, `read.spss` or `read.xport`(from foreign) or `load` or `readRDS` commands. By examining the file suffix, it chooses the appropriate way to read the file. For more complicated file structures, see the foreign package. For even more complicated file structures, see the rio or haven packages.

Note that `read.file` assumes by default that the first row has column labels (header =TRUE). If this is not true, then make sure to specify header = FALSE. If the file is fixed width, the assumption is that it does not have a header field. In the unlikely case that a fwf file does have a header, then you probably should try fn <- file.choose() and then my.data <- read.fwf(fn,header=TRUE,widths= widths)

Further note: If the file is a .Rda, .rda, etc. file, the read.file command will return the name and location of the file. It will prompt the user to load this file. In this case, it is necessary to either assign the output (the file name) to an object that has a different name than any of the objects in the file, or to call read.file() without any specification. Notice that loading an .Rda file can overwrite existing objects. Thus the warning and the need to do the second step.

If the file has no suffix the default action is to quit with a warning. However, if the filetype is specified, it will use that type in the reading (e.g. filetype="txt" will read as text file, even if there is no suffix.)

If the file is specified and has a prefix of http:// https:// it will be downloaded and then read.

Currently supported input formats are

.sav	SPSS.sav files
.csv	A comma separated file (e.g. from Excel or Qualtrics)
.txt	A typical text file
.TXT	A typical text file
.text	A typical text file
.data	A data file
.dat	A data file
.rds	A R data file
.Rds	A R data file (created by a write)
.Rda	A R data structure (created using save)
.rda	A R data structure (created using save)
.RData	A R data structure (created using save)
.rdata	A R data structure (created using save)
.R	A R data structure created using dput
.r	A R data structure created using dput
.xpt	A SAS data file in xport format
.XPT	A SAS data file in XPORT format

Some data files have an extra ' in the data (e.g. the NYT covid data base). These files can be read specifying quote ""

The foreign function `read.spss` is used to read SPSS .sav files using the most common options. Just as `read.spss` issues various warnings, so does `read.file`. In general, these can be ignored. For more detailed information about using `read.spss`, see the help pages in the foreign package.

If you have a file written by JMP, you must first export to a csv or text file.

The `write.file` function combines the `file.choose` and either `write.table` or `saveRDS`. By examining the file suffix, it chooses the appropriate way to write. For more complicated file structures, see the foreign package, or the save function in R Base. If no suffix is added, it will write as a .txt file. `write.file.csv` will write in csv format to an arbitrary file name.

Currently supported output formats are

.csv	A comma separated file (e.g. for reading into Excel)
.txt	A typical text file
.text	A typical text file
.rds	A R data file
.Rds	A R data file (created by a write)
.Rda	A R data structure (created using save)
.rda	A R data structure (created using save)
.R	A R data structure created using dput
.r	A R data structure created using dput

Many Excel based files specify missing values as a blank field. When reading from the clipboard, using `read.clipboard.tab` will change these blank fields to NA.

Sometimes missing values are specified as "." or "999", or some other values. These can be converted by the read.file command specifying what values are missing (e.g., na =".""). See the example for the reading from the remote mtcars.csv file.

`read.clipboard` was based upon a suggestion by Ken Knoblauch to the R-help listserve.

If the input file that was copied into the clipboard was an Excel file with blanks for missing data, then read.clipboard.tab() will correctly replace the blanks with NAs. Similarly for a csv file with blank entries, read.clipboard.csv will replace empty fields with NA.

`read.clipboard.lower` and `read.clipboard.upper` are adapted from John Fox's read.moments function in the sem package. They will read a lower (or upper) triangular matrix from the clipboard and return a full, symmetric matrix for use by factanal, `fa` , `ICLUST`, `pca`. `omega` , etc. If the diagonal is false, it will be replaced by 1.0s. These two function were added to allow easy reading of examples from various texts and manuscripts with just triangular output.

Many articles will report lower triangular matrices with variable labels in the first column. read.clipboard.lower will handle this case. Names must be in the first column if names=TRUE is specified.

Other articles will report upper triangular matrices with variable labels in the first row. read.clipboard.upper will handle this. Note that labels in the first column will not work for read.clipboard.upper. The names, if present, must be in the first row.

read.clipboard.fwf will read fixed format files from the clipboard. It includes a patch to read.fwf which will not read from the clipboard or from remote file. See read.fwf for documentation of how to specify the widths.

Value

the contents of the file to be read or of the clipboard.

Author(s)

William Revelle

Examples

```
#All of these functions are meant for interactive Input
#Because these are dynamic functions, they need to be run interactively and
# can not be run as examples.
#Thus they are not to be tested by CRAN

if(interactive()) {
 my.data <- read.file()  #search the directory for a file and then read it.
                         #return the result into an object
#or, if the file is a rda, etc. file
my.data <- read.file()  #return the path and instructions of how to load
  # without assigning a value.

filesList()  #search the system for a particular file and then list all the files in that directory
fileCreate() #search for a particular directory and create a file there.
write.file(Thurstone) #open the search window, choose a location and name the output file,
# write the data file (e.g., Thurstone ) to the file chosen

#the example data set from read.delim in the readr package to read a remote csv file
my.data <-read.file(
"https://github.com/tidyverse/readr/raw/master/inst/extdata/mtcars.csv",
na=".")   #the na option is used for an example, but is not needed for these data


#These functions read from the local clipboard and thus are interactive
my.data <- read.clipboard()   #space delimited columns
my.data <- read.clipboard.csv()  # , delimited columns
my.data <- read.clipboard.tab()  #typical input if copied from a spreadsheet
my.data <- read.clipboad(header=FALSE)  #data start on line 1
my.matrix <- read.clipboard.lower()
}
```

---

sai *State Anxiety data from the PMC lab over multiple occasions.*

Description

State Anxiety was measured two-three times in 11 studies at the Personality-Motivation-Cognition laboratory. Here are item responses for 11 studies (9 repeated twice, 2 repeated three times). In all studies, the first occasion was before a manipulation. In some studies, caffeine, or movies or incentives were then given to some of the participants before the second and third STAI was given. In addition, Trait measures are available and included in the tai data set (3032 subjects).

Usage

```
data(sai)
data(tai)
data(sai.dictionary)
```

Format

A data frame with 3032 unique observations on the following 23 variables.

`id` a numeric vector

`study` a factor with levels `ages` `cart` `fast` `fiat` `film` `flat` `home` `pat` `rob` `salt` `shedshop` `xray`

`time` 1=First, 2 = Second, 3=third administration

`TOD` TOD (time of day 1= 8:50-9:30 am,2 = 1=3 pm, 3= 7:-8pm

`drug` drug (placebo (0) vs. caffeine (1))

`film` film (1=Frontline (concentration camp), 2 = Halloween 3= National Geographic (control), 4- Parenthood (humor)

`anxious` anxious

`at.ease` at ease

`calm` calm

`comfortable` comfortable

`confident` confident

`content` content

`high.strung` high.strung

`jittery` jittery

`joyful` joyful

`nervous` nervous

`pleasant` pleasant

`rattled` over-excited and rattled

`regretful` regretful

`relaxed` relaxed

`rested` rested

`secure` secure

`tense` tense

`upset` upset

`worried` worried

`worrying` worrying

Details

The standard experimental study at the Personality, Motivation and Cognition (PMC) laboratory (Revelle and Anderson, 1997) was to administer a number of personality trait and state measures (e.g. the `epi`, `msq`, `msqR` and `sai`) to participants before some experimental manipulation of arousal/effort/anxiety. Following the manipulation (with a 30 minute delay if giving caffeine/placebo), some performance task was given, followed once again by measures of state arousal/effort/anxiety.

Here are the item level data on the `sai` (state anxiety) and the `tai` (trait anxiety). Scores on these scales may be found using the scoring keys. The `affect` data set includes pre and post scores for two studies (flat and maps) which manipulated state by using four types of movies.

In addition to being useful for studies of motivational state, these studies provide examples of test-retest and alternate form reliabilities. Given that 10 items overlap with the msqR data, they also allow for a comparison of immediate duplication of items with 30 minute delays.

Studies CART, FAST, SHED, RAFT, and SHOP were either control groups, or did not experimentally vary arousal/effort/anxiety.

AGES, CITY, EMIT, RIM, SALT, and XRAY were caffeine manipulations between time 1 and 2 (RIM and VALE were repeated day 1 and day 2)

FIAT, FLAT, MAPS, MIXX, and THRU were 1 day studies with film manipulation between time 1 and time 2.

SAM1 and SAM2 were the first and second day of a two day study. The STAI was given once per day. MSQ not MSQR was given.

VALE and PAT were two day studies with the STAI given pre and post on both days

RIM was a two day study with the STAI and MSQ given once per day.

Usually, time of day 1 = 8:50-9am am, and 2 = 7:30 pm, however, in rob, with paid subjects, the times were 0530 and 22:30.

Source

Data collected at the Personality, Motivation, and Cognition Laboratory, Northwestern University, between 1991 and 1999.

References

Charles D. Spielberger and Richard L. Gorsuch and R. E. Lushene, (1970) Manual for the State-Trait Anxiety Inventory.

Revelle, William and Anderson, Kristen Joan (1997) Personality, motivation and cognitive performance: Final report to the Army Research Institute on contract MDA 903-93-K-0008

Rafaeli, Eshkol and Revelle, William (2006), A premature consensus: Are happiness and sadness truly opposite affects? Motivation and Emotion, 30, 1, 1-12.

Smillie, Luke D. and Cooper, Andrew and Wilt, Joshua and Revelle, William (2012) Do Extraverts Get More Bang for the Buck? Refining the Affective-Reactivity Hypothesis of Extraversion. Journal of Personality and Social Psychology, 103 (2), 206-326.

Examples

```
data(sai)

table(sai$study,sai$time)  #show the counts for repeated measures

#Here are the keys to score the sai total score, positive and negative items
sai.keys <- list(sai = c("tense","regretful" , "upset", "worrying", "anxious", "nervous" ,
"jittery" , "high.strung", "worried" , "rattled","-calm",
"-secure","-at.ease","-rested","-comfortable", "-confident" ,"-relaxed" , "-content" ,
"-joyful", "-pleasant"  ) ,
sai.p = c("calm","at.ease","rested","comfortable", "confident", "secure" ,"relaxed" ,
       "content" , "joyful", "pleasant" ),
sai.n = c( "tense" , "anxious", "nervous" , "jittery" , "rattled",     "high.strung",
```

```
        "upset", "worrying","worried","regretful" )
)
tai.keys <- list(tai=c("-pleasant" ,"nervous" , "not.satisfied", "wish.happy",
   "failure","-rested", "-calm", "difficulties" , "worry" , "-happy" ,
   "disturbing.thoughts","lack.self.confidence",
   "-secure", "decisive" , "inadequate","-content","thoughts.bother","disappointments" ,
   "-steady" , "tension"  ),
   tai.pos = c("pleasant", "-wish.happy", "rested","calm","happy" ,"secure",
   "content","steady" ),
   tai.neg = c("nervous", "not.satisfied", "failure","difficulties", "worry",
    "disturbing.thoughts" ,"lack.self.confidence","decisive","inadequate" ,
    "thoughts.bother","disappointments","tension" )        )


#using the is.element function instead of the %in% function
#just get the control subjects
control <- subset(sai,is.element(sai$study,c("Cart", "Fast", "SHED", "RAFT", "SHOP")) )

#pre and post drug studies
drug <- subset(sai,is.element(sai$study, c("AGES","CITY","EMIT","SALT","VALE","XRAY")))

#pre and post film studies
film <- subset(sai,is.element(sai$study, c("FIAT","FLAT", "MAPS", "MIXX") ))

#this next set allows us to score those sai items that overlap with the msq item sets
msq.items <- c("anxious", "at.ease" ,"calm", "confident","content", "jittery",
 "nervous" ,  "relaxed" ,  "tense"  ,  "upset" ) #these overlap with the msq

sai.msq.keys <- list(pos =c( "at.ease" ,  "calm" , "confident", "content","relaxed"),
  neg = c("anxious", "jittery", "nervous" ,"tense"  ,   "upset"),
  anx = c("anxious", "jittery", "nervous" ,"tense", "upset","-at.ease" ,  "-calm" ,
  "-confident", "-content","-relaxed"))
sai.not.msq.keys <- list(pos=c(  "secure","rested","comfortable" ,"joyful" , "pleasant" ),
    neg=c("regretful","worrying", "high.strung","worried", "rattled" ),
    anx = c("regretful","worrying", "high.strung","worried", "rattled",     "-secure",
    "-rested", "-comfortable", "-joyful",  "-pleasant" ))
sai.alternate.forms <- list( pos1 =c( "at.ease","calm","confident","content","relaxed"),
  neg1 = c("anxious", "jittery", "nervous" ,"tense"  ,   "upset"),
  anx1 = c("anxious", "jittery", "nervous" ,"tense", "upset","-at.ease" ,  "-calm" ,
       "-confident", "-content","-relaxed"),
  pos2=c(  "secure","rested","comfortable" ,"joyful" , "pleasant" ),
  neg2=c("regretful","worrying", "high.strung","worried", "rattled" ),
  anx2 = c("regretful","worrying", "high.strung","worried", "rattled", "-secure",
    "-rested", "-comfortable", "-joyful",  "-pleasant" ))

sai.repeated <- c("AGES","Cart","Fast","FIAT","FILM","FLAT","HOME","PAT","RIM","SALT",
    "SAM","SHED","SHOP","VALE","XRAY")
sai12 <- subset(sai,is.element(sai$study,  sai.repeated)) #the subset with repeated measures

#Choose those studies with repeated measures by :
sai.control <- subset(sai,is.element(sai$study, c("Cart", "Fast", "SHED", "SHOP")))
sai.film <- subset(sai,is.element(sai$study, c("FIAT","FLAT") )  )
sai.drug <- subset(sai,is.element(sai$study, c("AGES",  "SALT", "VALE", "XRAY")))
```

```
sai.day <- subset(sai,is.element(sai$study, c("SAM", "RIM")))
```

Schutz *The Schutz correlation matrix example from Shapiro and ten Berge*

Description

Shapiro and ten Berge use the Schutz correlation matrix as an example for Minimum Rank Factor Analysis. The Schutz data set is also a nice example of how normal minres or maximum likelihood will lead to a Heywood case, but minrank factoring will not.

Usage

```
data("Schutz")
```

Format

The format is: num [1:9, 1:9] 1 0.8 0.28 0.29 0.41 0.38 0.44 0.4 0.41 0.8 ... - attr(*, "dimnames")=List of 2 ..$:1] "Word meaning" "Odd Words" "Boots" "Hatchets" ... ..$: chr [1:9] "V1" "V2" "V3" "V4" ...

Details

These are 9 cognitive variables of importance mainly because they are used as an example by Shapiro and ten Berge for their paper on Minimum Rank Factor Analysis.

The solution from the `fa` function with the fm='minrank' option is very close (but not exactly equal) to their solution.

This example is used to show problems with different methods of factoring. Of the various factoring methods, fm = "minres", "uls", or "mle" produce a Heywood case. Minrank, alpha, and pa do not.

See the blant data set for another example of differences across methods.

Source

Richard E. Schutz,(1958) Factorial Validity of the Holzinger-Crowdeer Uni-factor tests. Educational and Psychological Measurement, 48, 873-875.

References

Alexander Shapiro and Jos M.F. ten Berge (2002) Statistical inference of minimum rank factor analysis. Psychometrika, 67. 70-94

Examples

```
data(Schutz)
psych::corPlot(Schutz,numbers=TRUE,upper=FALSE)

f4min <- psych::fa(Schutz,4,fm="minrank")  #for an example of minimum rank factor Analysis
#compare to
f4 <- psych::fa(Schutz,4,fm="mle")  #for the maximum likelihood solution which has a Heywood case
```

`Spengler` *Project Talent data set from Marion Spengler and Rodica Damian*

Description

Project Talent gave 440,000 US high school students a number of personality and ability tests. Of these, the data fror 346,000 were available for followup. Subsequent followups were collected 11 and 50 years later. Marion Spengler and her colleagues Rodica Damian, and Brent Roberts reported on the stability and change across 50 years of personality and ability. Here is the correlation matrix of 25 of their variables (Spengler) as well as a slightly different set of 19 variables (Damian). This is a nice example of mediation and regression from a correlation matrix.

Usage

```
data("Damian")
```

Format

A 25 x 25 correlation matrix of demographic, personality, and ability variables, based upon 346,660 participants.

`Race/Ethnicity` 1 = other, 2 = white/caucasian

`Sex` 1=Male, 2=Female

`Age` Cohort =9th grade, 10th grade, 11th grade, 12th grade

`Parental` Parental SES based upon 9 questions of home value, family income, etc.

`IQ` Standardized composite of Verbal, Spatial and Mathematical

`Sociability etc.` 10 scales based upon prior work by Damian and Roberts

`Maturity` A higher order factor from the prior 10 scales

`Extraversion` The second higher order factor

`Interest` Self reported interest in school

`Reading` Self report reading skills

`Writing` Self report writing skills

`Responsible` Self reported responsibility scale

`Ed.11` Education level at 11 year followup

`Educ.50` Education level at 50 year followup

`OccPres.11` Occupational Prestige at 11 year followup

`OccPres.50` Occupational Prestige at 50 year followup

`Income.11` Income at 11 year followup

`Income.50` Income at 50 year followup

Details

Data from Project Talent was collected in 1960 on a representative sample of American high school students. Subsequent follow up 11 and 50 years later are reported by Spengler et al (2018) and others.

Source

Marion Spengler, supplementary material to Damian et al. and Spengler et al.

References

Rodica Ioana Damian and Marion Spengler and Andreea Sutu and Brent W. Roberts, 2018, Sixteen going on sixty-six: A longitudinal study of personality stability and change across 50 years Journal of Personality and Social Psychology

Marian Spengler and Rodica Ioana Damian and Brent W. Roberts (2018), How you behave in school predicts life success above and beyond family background, broad traits, and cognitive ability Journal of Personality and Social Psychology, 114 (4) 600-636

Examples

```
data(Damian)
Spengler.stat #show the basic descriptives of the original data set
psych::lowerMat(Spengler[psych::cs(IQ,Parental,Ed.11,OccPres.50),
                         psych::cs(IQ,Parental,Ed.11,OccPres.50)])
psych::setCor(OccPres.50 ~ IQ + Parental + (Ed.11),data=Spengler)
#we reduce the number of subjects for faster replication in this example
mod <- psych::mediate(OccPres.50 ~ IQ + Parental + (Ed.11),data=Spengler,
       n.iter=50,n.obs=1000) #for speed
summary(mod)
```

`spi` *A sample from the SAPA Personality Inventory including an item dictionary and scoring keys.*

Description

The SPI (SAPA Personality Inventory) is a set of 135 items primarily selected from International Personality Item Pool (ipip.ori.org). This is an example data set collected using SAPA procedures the sapa-project.org web site. This data set includes 10 demographic variables as well. The data set with 4000 observations on 145 variables may be used for examples in scale construction and validation, as well as empirical scale construction to predict multiple criteria.

Usage

```
data("spi")
data(spi.dictionary)
data(spi.keys)
```

Format

A data frame with 4000 observations on the following 145 variables. (The q numbers are the SAPA item numbers).

`age` Age in years from 11 -90

`sex` Reported biological sex (coded by X chromosones => 1=Male, 2 = Female)

`health` Self rated health 1-5: poor, fair, good, very good, excellent

`p1edu` Parent 1 education

`p2edu` Parent 2 education

`education` Respondents education: less than 12, HS grad, current univ, some univ, associate degree, college degree, in grad/prof, grad/prof degree

`wellness` Self rated "wellnes" 1-2

`exer` Frequency of exercise: very rarely, < 1/month, < 1/wk, 1 or 2 times/week, 3-5/wk, > 5 times/week

`smoke` never, not last year, < 1/month, <1/week, 1-3 days/week, most days, up to 5 x /day, up to 20 x /day, > 20x/day

`ER` Emergency room visits none, 1x, 2x, 3 or more times

`q_253` see the spi.dictionary for these items (q_253

`q_1328` see the dictionary for all items q_1328)

Details

Using the data contributed by about 125,000 visitors to the `https://www.SAPA-project.org/` website, David Condon has developed a hierarchical framework for assessing personality at two levels. The higher level has the familiar five factors that have been studied extensively in personality research since the 1980s – Conscientiousness, Agreeableness, Neuroticism, Openness, and Extraversion. The lower level has 27 factors that are considerably more narrow. These were derived based on administrations of about 700 public-domain IPIP items to 3 large samples. Condon describes these scales as being "empirically-derived" because relatively little theory was used to select the number of factors in the hierarchy and the items in the scale for each factor (to be clear, he means relatively little personality theory though he relied on quite a lot of sampling and statistical theory). You can read all about the procedures used to develop this framework in his book/manual. If you would like to reproduce these analyses, you can download the data files from Dataverse (links are also provided in the manual) and compile this script in R (he used knitR). Instructions are provided in the Preface to the manual.

This small subset of the data is provided for demonstration purposes.

Source

https://sapa-project.org/research/SPI/SPIdevelopment.pdf.

References

Condon, D. (2017) The SAPA Personality Inventory:An empirically-derived, hierarchically-organized self-report personality assessment model

Examples

```
data(spi)
data(spi.dictionary)
psych::bestScales(spi, criteria="health",dictionary=spi.dictionary)

sc <- psych::scoreVeryFast(spi.keys,spi) #much faster scoring for just scores
sc <- psych::scoreItems(spi.keys,spi)  #gives the alpha reliabilities and various stats

psych::corPlot(sc$corrected,numbers=TRUE,cex=.4,xlas=2,min.length=6,
     main="Structure of SPI (disattenuated r above the diagonal)")
```

---

usaf *17 anthropometric measures from the USAF showing a general factor*

Description

The correlation matrix of 17 anthropometric measures from the United States Air Force survey of 2420 airmen. The data are taken from the Anthropometry package and included here as a demonstration of a hierarchical factor structure suitable for analysis by the `omega` or `omegaSem`.

Usage

```
data("USAF")
```

Format

The format is: num [1:17, 1:17] 1 0.1148 -0.0309 -0.028 -0.0908 ... - attr(*, "dimnames")=List of 2 ..$: chr [1:17] "age" "weight" "grip" "height" ... ..$: chr [1:17] "age" "weight" "grip" "height" ...

Details

The original data were collected by the USAF and reported in Churchill et al, 1977. They are included as a data file of 2420 participants and 202 variables (the first being an id) in the Anthropometry package. The list of variable names may be found in Churchill et al, on pages 96-99.

The three (correlated) factor structure shows a clear height, bulk, and head size structure with an overall general factor (g) which may be interpreted as body size.

The variables included (and their variable numbers in Antropometry) are:

age	V1
weight	V2
grip strength	V12
height (stature)	V13

leg length	V26
knee height	V37
upper arm	V42
thumb tip reach	V47
in sleeve	V49
chest breadth	V52
hip breadth	V55
waist circumference	V71
thigh circumference	V97
scye circumference	V103
head circumference	V141
bitragion coronal	V145
head length	V150
glabella to wall	V181
external canthus to wall	V183

Note that these numbers are equivalant to the numbers in Churchill et al. The numbers in Anthropometry are these + 1.

Source

Guillermo Vinue, Anthropometry: An R Package for Analysis of Anthropometric Data, Journal of Statistical Software, (2017), 77, 6.

References

Edmund Churchill, Thomas Churchill, Paul Kikta (1977) The AMRL anthropmetric data bank library, volumes I-V. (Technical report AMRL-TR-77-1)) https://apps.dtic.mil/dtic/tr/fulltext/u2/a047314.pdf

Guillermo Vinue, Anthropometry: An R Package for Analysis of Anthropometric Data, Journal of Statistical Software, (2017), 77, 6.

Examples

```
data(USAF)
psych::corPlot(USAF,xlas=3)
psych::omega(USAF[c(4:8,10:19),c(4:8,10:19)])   #just the size variables
```

Utility   *Useful utility functions for file/directory exploration and manipulation.*

Description

Wrappers for dirname, file.choose, readLines. file.create, file.path to be called directly for listing directories, creating files, showing the files in a directory, and listing the content of files in a directory. `fileCreate` gives the functionality of `file.choose`(new=TRUE). `filesList` combines file.choose, dirname, and list.files to show the files in a directory, `fileScan` extends this and then returns the first few lines of each readable file

Usage

```
fileScan(f = NULL, nlines = 3, max = NULL, from = 1, filter = NULL)
filesList(f=NULL)
filesInfo(f=NULL,max=NULL)
fileCreate(newName="new.file")
```

Arguments

`f`	File path to use as base path (will use file.choose() if missing. If f is a directory, will list the files in that directory, if f is a file, will find the directory for that file and then list all of those files.)
`nlines`	How many lines to display
`max`	maximum number of files to display
`from`	First file (number) to display
`filter`	Just display files with "filter" in the name
`newName`	The name of the file to be created.

Details

Just a collection of simple wrappers to powerful core R functions. Allows the user more direct control of what directory to list, to create a file, or to display the content of files. The functions called include `file.choose`, `file.path`, `file.info`,`file.create`, `dirname`, and `dir.exists`. All of these are very powerful functions, but not easy to call interactively.

`fileCreate` will ask to locate a file using file.choose, set the directory to that location, and then prompt to create a file with the new.name. This is a workaround for file.choose(new=TRUE) which only works for Macs not using R.studio.

`filesInfo` will interactively search for a file and then list the information (size, date, ownership) of all the files in that directory.

`filesList` will interactively search for a file and then list all the files in same directory.

Note

Work arounds for core-R functions for interactive file manipulation

Author(s)

William Revelle

See Also

`read.file` to read in data from a file or `read.clipboard` from the clipboard. `dfOrder` to sort data.frames.

Examples

```
if(interactive()) {
#all of these require interactive input and thus are not given as examples

fileCreate("my.new.file.txt")
filesList()   #show the items in the directory where a file is displayed
fileScan() #show the content of the files in a directory
#or, if you have a file in mind
 f <- file.choose()  #go find it
filesList(f)
fileScan(f)
}
```

`vegetables` *Paired comparison of preferences for 9 vegetables*

Description

A classic data set for demonstrating Thurstonian scaling is the preference matrix of 9 vegetables from Guilford (1954). Used by Guiford, Nunnally, and Nunally and Bernstein, this data set allows for examples of basic scaling techniques.

Usage

```
data(vegetables)
```

Format

A data frame with 9 choices on the following 9 vegetables. The values reflect the perecentage of times where the column entry was preferred over the row entry.

`Turn` Turnips

`Cab` Cabbage

`Beet` Beets

`Asp` Asparagus

`Car` Carrots

`Spin` Spinach

`S.Beans` String Beans

`Peas` Peas

`Corn` Corn

Details

Louis L. Thurstone was a pioneer in psychometric theory and measurement of attitudes, interests, and abilities. Among his many contributions was a systematic analysis of the process of comparative judgment (thurstone, 1927). He considered the case of asking subjects to successively compare pairs of objects. If the same subject does this repeatedly, or if subjects act as random replicates of each other, their judgments can be thought of as sampled from a normal distribution of underlying (latent) scale scores for each object, Thurstone proposed that the comparison between the value of two objects could be represented as representing the differences of the average value for each object compared to the standard deviation of the differences between objects. The basic model is that each item has a normal distribution of response strength and that choice represents the stronger of the two response strengths. A justification for the normality assumption is that each decision represents the sum of many independent inputs and thus, through the central limit theorem, is normally distributed.

Thurstone considered five different sets of assumptions about the equality and independence of the variances for each item (Thurston, 1927). Torgerson expanded this analysis slightly by considering three classes of data collection (with individuals, between individuals and mixes of within and between) crossed with three sets of assumptions (equal covariance of decision process, equal correlations and small differences in variance, equal variances).

This vegetable data set is used by Guilford and by Nunnally to demonstrate Thurstonian scaling.

Source

Guilford, J.P. (1954) Psychometric Methods. McGraw-Hill, New York.

References

Nunnally, J. C. (1967). Psychometric theory., McGraw-Hill, New York.

Revelle, W. An introduction to psychometric theory with applications in R. (in preparation), Springer. https://personality-project.org/r/book/

See Also

thurstone

Examples

```
data(vegetables)
psych::thurstone(veg)
```

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