

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)

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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 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

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, William, Dworak, Elizabeth M. and Condon, David (2020) Cognitive ability in everyday life: the utility of open-source measures. *Current Directions in Psychological Science*, 29, (4) 358-363. Open access at doi: [10.1177/0963721420922178](https://doi.org/10.1177/0963721420922178).

Dworak, Elizabeth M., Revelle, William, Doebler, Philip and Condon, David (2021) Using the International Cognitive Ability Resource as an open source tool to explore individual differences in cognitive ability. *Personality and Individual Differences*, 169. Open access at doi: [10.1016/j.paid.2020.109906](https://doi.org/10.1016/j.paid.2020.109906).
 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.

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

#It is sometimes asked how to handle missing data when finding scores
#this next example compares 3 ways of scoring ability items from icar
#Just sum the items
#Sum the means for the items
#IRT score the items

total <- rowSums(ability, na.rm=TRUE)
means <- rowMeans(ability, na.rm=TRUE)
irt <- psych::scoreIrt(items=ability)[1]
df <- data.frame(total, means,irt)
psych:: pairs.panels(df)
```

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="Energetic 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 Openness. 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 Aperture 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 Publications.

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])
```

BFI.adjectives.dictionary

Dictionary for the 100 Big Five Adjectives

Description

Lew Goldberg organized 100 adjectives to measure 5 factors of personality (The Big5). 500 hundred participants were given these adjectives along with other personality measures. This dictionary allows for easy item labeling of the results. ~

Usage

```
data("BFI.adjectives.dictionary")
```


Format

A data frame with 100 observations on the following 2 variables.

`numer` a character vector of the item label

`Item` a character vector of the actual adjectives

Details

Keying information for the 100 adjectives:

Source

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

References

Lewis R. Goldberg,(1992) The development of markers for the Big-Five factor structure, Psychological Assessment, 4 (1) 26-42.

See Also

[big5.100.adjectives](#) for examples of the data. [msqR](#) 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.

Examples

```
data(BFI.adjectives.dictionary) #this includes the bfi.adjectives.keys
bfi.adjectives.keys <- list(
  Agreeableness =
  psych::cs(V2,-V11, V14, V15, -V19,-V21, V29,-V31, V32,V48, V55,-V61,-V63,
  V69, V76, -V78,-V79, -V90,-V94,V99),
  Conscientiousness = psych::cs(V9,-V10,V13, -V20,V22, -V30, -V37, -V38, -V39,
  V50, -V51, V53, V56, V57, -V67,V68, V70, V73, -V82, -V95),
  Extraversion = psych::cs(V1,V5,-V6,V7,V17, V24, V26, -V40,-V45, -V58,-V60,-V65,
  V71, -V74,-V77,V92, -V96,V97, V98, -V100),
  Neuroticism= psych::cs(V3, V23, V25, V27,V28, V33,-V36, V42, V46,V47, V49, V52,-V59,V62,
  V72, V75, -V81,-V83,-V84, -V85),
  Openness = psych::cs(V4,V8,V12, V16, V18,V34, -V35,V41, V43, V44, V54,-V64,-V66, -V80,
  -V86, -V87, -V88, -V89, -V91, -V93)
)

psych::lookupFromKeys(bfi.adjectives.keys,bfi.adjectives.dictionary,20)
```

big5.100.adjectives *100 adjectives describing the "big 5" for 502 subjects*

Description

Low Goldberg organized 100 adjectives to measure 5 factors of personality (The Big5). 500 hundred participants were given these adjectives along with other personality measures in the Personality, Motivation and Cognition (PMC) lab. This data set is for demonstrations of factor and cluster analysis.

Usage

```
data("big5.100.adjectives")
```

Format

A data frame with 554 observations on the following 102 variables.

study a character vector

id a numeric vector

V1 numeric vector (see big5.adjectives.dictionary)

V100 A numeric vector. (see big5.adjectives.dictionary)

bfi.adjectives.keys a key list

Details

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 as well as other personality trait measures (e.g. the Big 5 adjectives)

Source

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

References

Lewis R. Goldberg,(1992) The development of markers for the Big-Five factor structure, Psychological Assessment, 4 (1) 26-42.

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>).

Examples

```
data(big5.100.adjectives)
five.scores <- psych::scoreItems(big5.adjectives.keys, big5.100.adjectives)
summary(five.scores)
```

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(blots)

#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
blots.fa <- psych::irt.fa(blots) # a 2PN model
plot(blots.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 organization 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 Atlanta, 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, Louisiana

Details

An 11 x 11 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 data 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 0.6mg 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 detail1, 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,long=FALSE)
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
long	if TRUE, then do long tables. (requires the longtables package in latex)

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

<code>object</code>	The <code>data.frame</code> to be sorted
<code>columns</code>	Column numbers to use for sorting. If positive, then they will be sorted in increasing order. If negative, then in decreasing order
<code>absolute</code>	If <code>TRUE</code> , then sort the absolute values
<code>ascending</code>	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
```

eminence

Eminence of 69 American Psychologists

Description

Marco Del Giudice criticized an earlier study by Simonton for using partial regression weights to estimate the importance of various predictors of rated eminence. This is a nice example of the (mis)interpretation of beta weights of highly correlated predictors.

Usage

```
data("eminence")
```

Format

A data frame with 69 observations on the following 9 variables.

name a character vector

reputation Log of rated reputation

birth.year Year of birth

first.year Year of first cited publicatin

last.year Year of last cited publication

works Log of number of publications

citations Log of number of citations

composite A composite index of publications

h The 'h' index of citations

Details

Simonton (1997, 2014) discusses various estimates of eminence among 69 psychologists born between 1842 and 1912 and reports that the regression weights are small and interprets this as meaning number of publications and citations are not very important. Del Giudice (2020) points out that citations and the number of publications are highly collinear and thus while their independent contributions are small, their joint effect is quite large ($R = .69$). These data are given here as an example of multiple correlation and partial correlation

Source

Del Giudice (2020) links to a web page with the data.

References

- Marco Del Giudice (2020). How Well Do Bibliometric Indicators Correlate With Scientific Eminence? A Comment on Simonton (2016). *Perspectives in Psychological Science*, 15, 202-203.
- Simonton, D. K. (1992). Leaders of American psychology, 1879-1967: Career development, creative output, and professional achievement. *Journal of Personality and Social Psychology*, 62, 5-17.
- Simonton, D. K. (2016). Giving credit where credit is due: Why it's so hard to do in psychological science. *Perspectives on Psychological Science*, 11, 888-892.

Examples

```
data(eminence)
psych::lowerCor(eminence)
cs <- psych::cs
psych::partial.r(eminence, x= cs(reputation, works, citations),y=cs(birth.year))
psych::setCor(reputation ~ works + h + first.year,data=eminence)
```

 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 (1980) 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.

Revelle, W. and Humphreys, M. S. and Simon, L. and Gilliland, K. (1980) Interactive effect of personality, time of day, and caffeine: A test of the arousal model, Journal of Experimental Psychology General, 109, 1, 1-31,

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

bfragee 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")

```

 GERAS

Data from Gruber et al, 2020, Study 2: Gender Related Attributes Survey

Description

Gruber et al. (2020) report on the psychometric properties of a multifaceted Gender Related Attributes Survey. Here are the data from their 3 domains (Personality, Cognition and Activities and Interests from their study 2. Eagly and Revelle (in press) include these data in their review of the power of aggregation. The data are included here as demonstrations of the [cohen.d](#) and [scatterHist](#) functions in the psych package and may be used to show the power of aggregation.

Usage

```

data("GERAS")
#These other objects are included in the file
# data("GERAS.scales")
# data("GERAS.dictionary")
# data("GERAS.items")
# data("GERAS.keys")

```

Format

A data frame with 471 observations on the following 51 variables (selected from the original 93)
The code numbers are item numbers from the bigger set.

V15 reckless
 V22 willing to take risks
 V11 courageous
 V6 a adventurous
 V19 dominant
 V14 controlling
 V20 boastful

- V21 rational
- V23 analytical
- V9 pragmatic
- V44 to find an address for the first time
- V45 to find a way again
- V46 to understand equations
- V50 to follow directions
- V51 to understand equations
- V53 day-to-day calculations
- V48 to write a computer program
- V69 paintball
- V73 driving go-cart
- V71 drinking beer
- V68 watching action movies
- V75 playing cards (poker)
- V72 watching sports on TV
- V67 doing certain sports (e.g. soccer, ...)
- V74 Gym (weightlifting)
- V27 warm-hearted
- V28 loving
- V29 caring
- V26 compassionate
- V32 delicate
- V30 tender
- V24 family-oriented
- V40 anxious
- V39 thin-skinned
- V41 careful
- V55 to explain foreign words
- V58 to find the right words to express certain content
- V59 synonyms for a word in order to avoid repetitions
- V60 to phrase a text
- V54 remembering events from your own life
- V63 to notice small changes
- V57 to remember names and faces
- V89 shopping
- V92 gossiping

V81 watching a romantic movie
 V80 talking on the phone with a friend
 V90 yoga
 V83 rhythmic gymnastics
 V84 going for a walk
 V86 dancing
 gender gender (M=1 F=2)

Details

These 50 items (+ gender) may be formed into scales using the GERAS.keys The first 10 items are Male Personality, the next 10 are Female Personality, then 7 and 7 M and F Cognition, then 8 and 8 M and F Activity items. The Pers, Cog and Act scales are formed from the M-F scales for the three domains. M and F are the composites of the Male and then the Female scales. MF.all is the composite of the M - F scales. See the GERAS.keys object for scoring directions.

"M.pers" "F.pers" "M.cog" "F.cog" "M.act" "F.act" "Pers" "Cog" "Act" "M" "F" "MF.all" "gender"

Source

Study 2 data downloaded from the Open Science Framework <https://osf.io/42jhr/> Used by kind permission of Freya M. Gruber, Tullia Ortner, and Belinda A. Pletzer.

References

Alice H. Eagly and William Revelle, Understanding the Magnitude of Psychological Differences Between Women and Men Requires Seeing the Forest and the Tree. Perspectives in Psychological Science (in press)

Gruber, Freya M. and Distlberger, Eva and Scherndl, Thomas and Ortner, Tuulia M. and Pletzer, Belinda (2020) Psychometric properties of the multifaceted Gender-Related Attributes Survey (GERAS) European Journal of Psychological Assessment, 36, (4) 612-623.

Examples

```
data(GERAS)
GERAS.keys #show the keys
#show the items from the dictionary
psych::lookupFromKeys(GERAS.keys, GERAS.dictionary[,1,drop=FALSE])

#now, use the GERAS.scales to show a scatterHist plot showing univariate d and bivariate
# Mahalanobis D.

psych::scatterHist(F ~ M + gender, data=GERAS.scales, cex.point=.3,smooth=FALSE,
xlab="Masculine Scale",ylab="Feminine Scale",correl=FALSE,
d.arrow=TRUE,col=c("red","blue"), bg=c("red","blue"), lwd=4, title="Combined M and F
scales",cex.cor=2,cex.arrow=1.25, cex.main=2)
```

globalWarm

7 attitude items about Global Warming policy from Erik Nisbet

Description

Erik Nisbet reported the relationship between emotions, ideology, and party affiliation as predictors of attitudes towards government action on climate change. The data were used by Hayes (2013) in a discussion of regression. They are available as the glbwarm data set in the processR package. They are copied here for examples of mediation.

Usage

```
data("globalWarm")
```

Format

A data frame with 815 observations on the following 7 variables.

```
govact a numeric  
posemot a numeric  
negemot a numeric  
ideology a numeric  
age a numeric  
sex a numeric  
partyid a numeric
```

Details

More details to follow

Source

The raw data are available from the processR package (Keon-Woong Moon, 2020). as the glbwarm data set. The data set is used by Hayes in several examples. Used here by kind permission of Erik Nisbet.

References

Nisbet, E. (?)

Hayes, Andrew F. (2013) Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford Press.

Examples

```
data(globalWarm)
psych::lowerCor(globalWarm)
```

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_frmboard 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 discrimination of straight and curved caps
 t14_wordrecg Memory of Target Words
 t15_numbrechg 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 original 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 performance, 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.

The variables v1 ... v9 in the lavaan package correspond to tests 1, 2, 4, 6, 7, 9, 10, 12 and 13.

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)

#Compare these to the lavaan correlation matrix
psych::lowerCor(holzinger.swineford[ 7+ c(1, 2, 4, 6, 7, 9, 10, 12, 13)])

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 effects
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 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 Ability 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 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, William, Dworak, Elizabeth M. and Condon, David (2020) Cognitive ability in everyday life: the utility of open-source measures. *Current Directions in Psychological Science*, 29, (4) 358-363. Open access at doi: [10.1177/0963721420922178](https://doi.org/10.1177/0963721420922178).
- Dworak, Elizabeth M., Revelle, William, Doebler, Philip and Condon, David (2021) Using the International Cognitive Ability Resource as an open source tool to explore individual differences in cognitive ability. *Personality and Individual Differences*, 169. Open access at doi: [10.1016/j.paid.2020.109906](https://doi.org/10.1016/j.paid.2020.109906).
- 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 Publications.

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 statistics
#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 impa 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 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.
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- 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" )
#, acquiescence = 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.
- Rafaëli, 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" ))

#acquiescence = 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,frenziend,jittery,nervous),
  activated.displeasure =psych::cs(scared,upset,shaky,fearful,clutched.up,tense,
    ashamed,guilty,agitated,hostile),
  displeasure =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),
  deactivated.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. Various 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 instructors, *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")
```

 Pollack

Pollack et al (2012) correlation matrix for mediation example

Description

A correlation matrix taken from Pollack (2012) with 9 variables. Primarily used as an example for setCor and mediation.

Usage

```
data("Pollack")
```

Format

A correlation matrix based upon 262 participants.

sex Male = 1, Female = 0, 62% male

age mean =33

tenure length of employment, mean = 5.9 years

self.efficacy self ratings

competence self rating of competence

social.ties Contact with business-related social ties

economic.stress mean of two items on economic stress

depression 6 items from MAACL measuring depression

withdrawal Withdrawal intentions in domain of entrepreneurship

Details

This is the correlation matrix from Pollack et al. (2012) p 797. The raw data are available from the processR package (Keon-Woong Moon, 2020). The data set is used by Hayes in example p 179 in example 3.

Source

Pollack et al. 2012

References

Pollack, Jeffrey M. and Vanepps, Eric M. and Hayes, Andrew F. (2012). The moderating role of social ties on entrepreneurs' depressed affect and withdrawal intentions in response to economic stress, *Journal of Organizational Behavior* 33 (6) 789-810.

Hayes, Andrew F. (2013) *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Examples

```
psych::lowerMat(Pollack)
```

psychTools	<i>psychTools: datasets and utility functions to accompany the psych package</i>
------------	--

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 are 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

<code>burt</code>	11 emotional variables from Burt (1915)
<code>galton</code>	Galtons Mid parent child height data
<code>heights</code>	A data.frame of the Galton (1888) height and cubit data set
<code>cubits</code>	Galtons example of the relationship between height and cubit or forearm length
<code>peas</code>	Galtons Peas
<code>cushny</code>	The data set from Cushny and Peebles (1905) on the effect of three drugs on hours of sleep, used by
<code>holzinger.swineford</code>	26 cognitive variables + 7 demographic variables for 301 cases from Holzinger and Swineford.

Miscellaneous example data sets

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

Functions to convert various objects to latex

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

File manipulation functions

<code>fileCreate</code>	Create a file
<code>fileScan</code>	Show the first few lines of multiple files
<code>filesInfo</code>	Show the information for all files in a directory
<code>filesList</code>	Show the names of all files in a directory

`dfOrder` Sorts a data frame

File input/output functions

<code>read.clipboard</code>	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	<i>Shortcuts for reading from the clipboard or a file</i>
-----------	---

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 separator 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, `read.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

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

<code>.csv</code>	A comma separated file (e.g. for reading into Excel)
<code>.txt</code>	A typical text file
<code>.text</code>	A typical text file
<code>.rds</code>	A R data file
<code>.Rds</code>	A R data file (created by a write)
<code>.Rda</code>	A R data structure (created using save)
<code>.rda</code>	A R data structure (created using save)
<code>.R</code>	A R data structure created using dput
<code>.r</code>	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.clipboard(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(*, "dim-names")=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 for 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, 2019, Sixteen going on sixty-six: A longitudinal study of personality stability and change across 50 years *Journal of Personality and Social Psychology*, 117, (3) 274-695.

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	<i>A sample from the SAPA Personality Inventory including an item dictionary and scoring keys.</i>
-----	--

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 chromosomes => 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.

The content of the spi items may be seen by examining the spi.dictionary. Included in the dictionary are the item_id number from the SAPA project, the wording of the item, the source of the item, which Big 5 scale the item marks, and which "Little 27" scale the item marks.

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

An analysis using the spi data set and various tools from the psych package may be found at

Revelle, Dworak and Condon, (2021) Exploring the persome: the power of the item in understanding personality structure. *Personality and Individual Differences*, 169, 1. Doi: 10.1016/j.paid.2020.109905.

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::scoreOverlap(spi.keys, spi) #gives the alpha reliabilities and various stats
#these are corrected for overlap
psych::corPlot(sc$corrected, numbers=TRUE, cex=.4, xlas=2, min.length=6,
  main="Structure of SPI (Corrected for overlap) 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
bitracion coronal	V145
head length	V150
glabella to wall	V181
external canthus to wall	V183

Note that these numbers are equivalent 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 anthropometric 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

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