

# Package ‘psychTools’

September 20, 2021

**Version** 2.1.8

**Date** 2021-09-19

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

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

**License** GPL (>= 2)

**Imports** foreign,psych

**Suggests** parallel, GPArotation, lavaan, knitr

**Depends** R(>= 2.10)

**LazyData** yes

**ByteCompile** TRUE

**VignetteBuilder** knitr

**URL** <https://personality-project.org/r/psych/>  
<https://personality-project.org/r/psych-manual.pdf>

**NeedsCompilation** no

**Author** William Revelle [aut, cre] (<<https://orcid.org/0000-0003-4880-9610>>)

**Maintainer** William Revelle <revelle@northwestern.edu>

**Repository** CRAN

**Date/Publication** 2021-09-20 20:20:02 UTC

## R topics documented:

ability . . . . .	2
affect . . . . .	4
bfi . . . . .	6
BFI.adjectives.dictionary . . . . .	8
big5.100.adjectives . . . . .	9

blant . . . . .	11
blot . . . . .	12
burt . . . . .	13
cities . . . . .	15
cubits . . . . .	16
cushny . . . . .	17
df2latex . . . . .	18
dfOrder . . . . .	21
epi . . . . .	22
epi.bfi . . . . .	25
galton . . . . .	26
GERAS . . . . .	27
globalWarm . . . . .	30
heights . . . . .	31
holzinger.swineford . . . . .	32
income . . . . .	36
iqitems . . . . .	37
msq . . . . .	39
msqR . . . . .	45
neo . . . . .	53
peas . . . . .	55
Pollack . . . . .	56
psychTools . . . . .	57
read.file . . . . .	59
sai . . . . .	64
Schutz . . . . .	67
Spengler . . . . .	68
spi . . . . .	70
usaf . . . . .	72
Utility . . . . .	73
vegetables . . . . .	75
<b>Index</b>	<b>77</b>

---

ability	<i>16 ability items scored as correct or incorrect.</i>
---------	---

---

### 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
```

---

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](http://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)  
 01 Am full of ideas. (q\_128)  
 02 Avoid difficult reading material.(q\_316)  
 03 Carry the conversation to a higher level. (q\_492)  
 04 Spend time reflecting on things. (q\_1738)  
 05 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(blots)
```

## Format

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

## Details

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

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

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

## Source

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

## References

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

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

## See Also

See also the [irt.fa](#) and associated plot functions.

## Examples

```
data(blot)

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

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

---

burt

*11 emotional variables from Burt (1915)*

---

## Description

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

## Usage

```
data(burt)
```

## Format

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

**Sociality** Sociality

**Sorrow** Sorrow

**Tenderness** Tenderness

**Joy** Joy

**Wonder** Wonder

**Elation** Elation

**Disgust** Disgust

**Anger** Anger

**Sex** Sex

**Fear** Fear

**Subjection** Subjection

## Details

The Burt data set is interesting for several reasons. It seems to be an early example of the 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 <a href="#">fa</a> or <a href="#">irt.fa</a> .
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
```

---

epi

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


---

**Description**

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

**Usage**

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

**Format**

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

`id` The identification number within the study  
`time` First (group testing) or 2nd time (before a lab experiment) for the `epiR` data set.  
`study` Four lab based studies and their pretest data  
`V1` a numeric vector  
`V2` a numeric vector  
`V3` a numeric vector  
`V4` a numeric vector

V5 a numeric vector  
V6 a numeric vector  
V7 a numeric vector  
V8 a numeric vector  
V9 a numeric vector  
V10 a numeric vector  
V11 a numeric vector  
V12 a numeric vector  
V13 a numeric vector  
V14 a numeric vector  
V15 a numeric vector  
V16 a numeric vector  
V17 a numeric vector  
V18 a numeric vector  
V19 a numeric vector  
V20 a numeric vector  
V21 a numeric vector  
V22 a numeric vector  
V23 a numeric vector  
V24 a numeric vector  
V25 a numeric vector  
V26 a numeric vector  
V27 a numeric vector  
V28 a numeric vector  
V29 a numeric vector  
V30 a numeric vector  
V31 a numeric vector  
V32 a numeric vector  
V33 a numeric vector  
V34 a numeric vector  
V35 a numeric vector  
V36 a numeric vector  
V37 a numeric vector  
V38 a numeric vector  
V39 a numeric vector  
V40 a numeric vector  
V41 a numeric vector

V42 a numeric vector  
V43 a numeric vector  
V44 a numeric vector  
V45 a numeric vector  
V46 a numeric vector  
V47 a numeric vector  
V48 a numeric vector  
V49 a numeric vector  
V50 a numeric vector  
V51 a numeric vector  
V52 a numeric vector  
V53 a numeric vector  
V54 a numeric vector  
V55 a numeric vector  
V56 a numeric vector  
V57 a numeric vector

### Details

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

The actual items may be found in the [epi.dictionary](#).

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

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

### Source

Data from the PMC laboratory at Northwestern.

### References

- Eysenck, H.J. and Eysenck, S. B.G. (1968). Manual for the Eysenck Personality Inventory. Educational and Industrial Testing Service, San Diego, CA.
- Rocklin, T. and Revelle, W. (1981). The measurement of extraversion: A comparison of the Eysenck Personality Inventory and the Eysenck Personality Questionnaire. *British Journal of Social Psychology*, 20(4):279-284.



**Examples**

```

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

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

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

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

```

---

epi.bfi	<i>13 personality scales from the Eysenck Personality Inventory and Big 5 inventory</i>
---------	---

---

**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\_frmbord Paper formboard-Shapes that can be combined to form a target  
t04\_lozenges Lozenges from Thorndike-Shapes flipped over then identify target  
t05\_geninfo General Information Verbal Test  
t06\_paracomp Paragraph Comprehension Test  
t07\_sentcomp Sentence Completion Test  
t08\_wordclas Word clasification-Which word not belong in set  
t09\_wordmean Word Meaning Test  
t10\_addition Speeded addition test  
t11\_code Speeded codetest-Transform shapes into alpha with code  
t12\_countdot Speeded counting of dots in shap  
t13\_sccaps Speeded discrimination of straight and curved caps  
t14\_wordrecg Memory of Target Words  
t15\_numbrecg Memory of Target Numbers  
t16\_figrrecg Memory of Target Shapes  
t17\_objnumb Memory of object-Number association targets  
t18\_numbfig Memory of number-Object association targets  
t19\_figword Memory of figure-Word association target  
t20\_deduction Deductive Math Ability  
t21\_numbpuzz Math number puzzles  
t22\_probreas Math word problem reasoning  
t23\_series Completion of a Math Number Series  
t24\_woody Woody-McCall mixed math fundamentals test  
t25\_frmbord2 Revision of t3-Paper form board  
t26\_flags Flags-possible substitute for t4 lozenges

## Details

The following commentary was provided by Keith Widaman:

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

Rosseel, who developed the ‘lavaan’ package for R, included 9 of the manifest variables from Holzinger and Swineford (1939) as a “resident” data set when one downloads the ‘lavaan’ package. Several background variables are included in this “resident” data set in addition to 9 of the psychological tests (which are named x1 – x9 in the data set). When analyzing these data, I found the distributions of the variables (means, SDs) did not match the sample statistics from the original article. For example, in the “resident” data set in ‘lavaan’, scores on all manifest variables ranged between 0 and 10, sample means varied between 3 and 6, and sample SDs varied between 1.0 and 1.5. In the original data set, scores ranges were rather different across tests, with some variables having scores that ranged between 0 and 20, but other manifest variables having scores ranging from 50 to over 300 – with obvious attendant differences in sample means and SDs.

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

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

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

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

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

... Widaman continues:

“As several persons have noted, Harman (1976) used data only from the Grant-White school (N = 145) for his 24 Psychological Variables data set. In doing so, Harman replaced t03\_frmboard and t04\_lozenges with t25\_frmboard2 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](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 imp item knob MAPS mite pat-1 pat-2 PATS post RAFT  
 Rim.1 Rim.2 rob-1 rob-2 ROG1 ROG2 SALT sam-1 sam-2 SAVE/PATS sett swam swam-2 TIME  
 VALE-1 VALE-2 VIEW

## Details

The Motivational States Questionnaire (MSQ) is composed of 72 items, which represent the full affective space (Revelle & Anderson, 1998). The MSQ consists of 20 items taken from the Activation-Deactivation Adjective Check List (Thayer, 1986), 18 from the Positive and Negative Affect Schedule (PANAS, Watson, Clark, & Tellegen, 1988) along with the items used by Larsen and Diener (1992). The response format was a four-point scale that corresponds to Russell and Carroll's (1999) "ambiguous-likely-unipolar format" and that asks the respondents to indicate their current standing ("at this moment") with the following rating scale:

0—————1—————2—————3  
 Not at all A little Moderately Very much

The original version of the MSQ included 70 items. Intermediate analyses (done with 1840 subjects) demonstrated a concentration of items in some sections of the two dimensional space, and a paucity of items in others. To begin correcting this, 3 items from redundantly measured sections (alone,

kindly, scornful) were removed, and 5 new ones (anxious, cheerful, idle, inactive, and tranquil) were added. Thus, the correlation matrix is missing the correlations between items anxious, cheerful, idle, inactive, and tranquil with alone, kindly, and scornful.

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

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

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

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

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

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

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

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

Keys for these separate scales are shown in the examples.

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

## Source

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

## References

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

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>).

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.
- Rafaeli, Eshkol and Revelle, William (2006), A premature consensus: Are happiness and sadness truly opposite affects? *Motivation and Emotion*, 30, 1, 1-12.
- Revelle, W. and Anderson, K.J. (1998) Personality, motivation and cognitive performance: Final report to the Army Research Institute on contract MDA 903-93-K-0008. (<https://www.personality-project.org/revelle/publications/ra.ari.98.pdf>).
- Smillie, Luke D. and Cooper, Andrew and Wilt, Joshua and Revelle, William (2012) Do Extraverts Get More Bang for the Buck? Refining the Affective-Reactivity Hypothesis of Extraversion. *Journal of Personality and Social Psychology*, 103 (2), 206-326.
- Thayer, R.E. (1989) *The biopsychology of mood and arousal*. Oxford University Press. New York, NY.
- Watson, D., Clark, L.A. and Tellegen, A. (1988) Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6):1063-1070.

### See Also

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

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

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

## Examples

```

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

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

#acquiscence = c("sleepy", "wakeful", "relaxed","tense")
#Yik Russell and Steiger list the following items
Yik.keys <- list(
pleasure =psych::cs(happy,content,satisfied, pleased),
act.pleasure =psych::cs(proud,enthusiastic,euphoric),
pleasant.activation = psych::cs(energetic,full.of.pep,excited,wakeful,attentive,
      wide.awake,active,alert,vigorous),
activation = psych::cs(aroused,hyperactivated,intense),
unpleasant.act = psych::cs(anxious,frenzied,jittery,nervous),
activated.displeasure =psych::cs(scared,upset,shaky,fearful,clutched.up,tense,
      ashamed,guilty,agitated,hostile),
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

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

---

**Description**

PsychTools includes the larger data sets used by the [psych](#) package and also includes a few general utility functions such as the [read.file](#) and [read.clipboard](#) functions. The data sets 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:

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

### Historically interesting data sets

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

### Miscellaneous example data sets

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

veg Paired comparison of preferences for 9 vegetables (scaling example)

Functions to convert various objects to latex

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

File manipulation functions

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

dfOrder Sorts a data frame

File input/output functions

read.clipboard Shortcuts for reading from the clipboard or a file  
read.clipboard.csv  
read.clipboard.fwf  
read.clipboard.lower  
read.clipboard.tab  
read.clipboard.upper  
read.file Read a file according to its suffix  
read.file.csv  
read.https  
write.file Write data to a file  
write.file.csv

## Examples

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

---

read.file

*Shortcuts for reading from the clipboard or a file*

---

## Description

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

## Usage

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

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

#read in data using a fixed format width (see read.fwf for instructions)
read.clipboard.fwf(header=FALSE,widths=rep(1,10),...)

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

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

## Arguments

header	Does the first row have variable labels (generally assumed to be TRUE).
sep	What is the designated 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, <code>file.choose</code> 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 <code>file.choose</code> is called to dynamically get the file name.
x	The data frame or matrix to write to f
row.names	Should the output file include the rownames? By default, no.
to.data.frame	Should the spss input be converted to a data frame?
use.value.labels	Should the SPSS input values be converted to numeric?
filetype	If specified the reading will use this term rather than the suffix.

### Details

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

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

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

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

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

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

Currently supported input formats are

<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 dput
<code>.r</code>	A R data structure created using dput
<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")))

```

**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 from 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

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

---

**Description**

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

**Usage**

```

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

```

**Format**

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

age Age in years from 11 -90

sex Reported biological sex (coded by X 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)
```

# Index

- \* **IO**
  - read.file, [59](#)
  - Utility, [73](#)
- \* **datasets**
  - ability, [2](#)
  - affect, [4](#)
  - bfi, [6](#)
  - BFI.adjectives.dictionary, [8](#)
  - big5.100.adjectives, [9](#)
  - blant, [11](#)
  - blot, [12](#)
  - burt, [13](#)
  - cities, [15](#)
  - cubits, [16](#)
  - cushny, [17](#)
  - epi, [22](#)
  - epi.bfi, [25](#)
  - galton, [26](#)
  - GERAS, [27](#)
  - globalWarm, [30](#)
  - heights, [31](#)
  - holzinger.swineford, [32](#)
  - income, [36](#)
  - iqitems, [37](#)
  - msq, [39](#)
  - msqR, [45](#)
  - neo, [53](#)
  - peas, [55](#)
  - Pollack, [56](#)
  - psychTools, [57](#)
  - sai, [64](#)
  - Schutz, [67](#)
  - Spengler, [68](#)
  - spi, [70](#)
  - usaf, [72](#)
  - vegetables, [75](#)
- \* **file**
  - Utility, [73](#)
- \* **manip**
  - dfOrder, [21](#)
- \* **multivariate**
  - read.file, [59](#)
- \* **utilities**
  - df2latex, [18](#)
  - dfOrder, [21](#)
- ability, [2](#), [38](#), [58](#)
- affect, [4](#), [9](#), [43](#), [44](#), [49](#), [50](#), [58](#), [65](#)
- all.income (income), [36](#)
- alpha, [24](#)
  
- bfi, [6](#), [58](#)
- bfi.adjectives (big5.100.adjectives), [9](#)
- BFI.adjectives.dictionary, [8](#)
- bfi.adjectives.dictionary
  - (BFI.adjectives.dictionary), [8](#)
- bi.bars, [8](#)
- big5.100.adjectives, [9](#), [9](#)
- big5.adjectives.dictionary
  - (BFI.adjectives.dictionary), [8](#)
- big5.adjectives.keys
  - (big5.100.adjectives), [9](#)
- blant, [11](#), [58](#)
- blot, [12](#), [58](#)
- burt, [13](#), [58](#)
  
- cities, [15](#), [58](#)
- city.location (cities), [15](#)
- cohen.d, [27](#)
- cor.smooth, [14](#)
- cor2latex, [59](#)
- cor2latex (df2latex), [18](#)
- cubits, [16](#), [27](#), [31](#), [32](#), [56](#), [58](#)
- cushny, [17](#), [58](#)
  
- Damian, [58](#)
- Damian (Spengler), [68](#)
- df2latex, [18](#), [59](#)
- dfOrder, [21](#), [21](#), [22](#), [59](#), [74](#)

- dir.exists, [74](#)
- dirname, [74](#)
- ellipses, [17](#), [32](#)
- epi, [22](#), [58](#), [65](#)
- epi.bfi, [25](#), [58](#)
- epi.dictionary, [24](#)
- epiR, [58](#)
- epiR (epi), [22](#)
- estress (Pollack), [56](#)
- fa, [11](#), [19](#), [44](#), [50](#), [63](#), [68](#)
- fa.extension, [44](#), [50](#)
- fa2latex, [59](#)
- fa2latex (df2latex), [18](#)
- file.choose, [61](#), [62](#), [73](#), [74](#)
- file.create, [74](#)
- file.info, [74](#)
- file.path, [74](#)
- fileCreate, [22](#), [59](#), [73](#), [74](#)
- fileCreate (Utility), [73](#)
- fileScan, [22](#), [73](#)
- fileScan (Utility), [73](#)
- filesInfo, [22](#), [74](#)
- filesInfo (Utility), [73](#)
- filesList, [22](#), [73](#), [74](#)
- filesList (Utility), [73](#)
- flat (affect), [4](#)
- galton, [17](#), [26](#), [32](#), [56](#), [58](#)
- GERAS, [27](#)
- glbwarm (globalWarm), [30](#)
- globalWarm, [30](#)
- Harman, [14](#)
- Harman.Burt, [14](#)
- heights, [16](#), [17](#), [27](#), [31](#), [31](#), [56](#), [58](#)
- holzinger.dictionary
  - (holzinger.swineford), [32](#)
- holzinger.raw, [35](#)
- holzinger.raw (holzinger.swineford), [32](#)
- holzinger.swineford, [32](#), [58](#)
- ICC2latex, [59](#)
- ICC2latex (df2latex), [18](#)
- ICLUST, [63](#)
- income, [36](#), [58](#)
- iqitems, [2](#), [37](#), [58](#)
- irt.fa, [2](#), [3](#), [7](#), [8](#), [13](#), [19](#), [38](#)
- irt2latex, [59](#)
- irt2latex (df2latex), [18](#)
- load, [61](#)
- make.keys, [7](#), [44](#), [50](#)
- maps (affect), [4](#)
- msq, [5](#), [39](#), [50](#), [58](#), [65](#)
- msqR, [5](#), [9](#), [24](#), [44](#), [45](#), [50](#), [58](#), [65](#)
- neo, [53](#), [58](#)
- omega, [3](#), [24](#), [38](#), [63](#), [72](#)
- omega2latex (df2latex), [18](#)
- omegaSem, [72](#)
- order, [21](#)
- pca, [63](#)
- peas, [17](#), [27](#), [55](#), [58](#)
- Pollack, [56](#)
- polychoric, [7](#)
- psych, [57](#)
- psychTools, [57](#)
- read.clipboard, [22](#), [57](#), [59–61](#), [63](#), [74](#)
- read.clipboard (read.file), [59](#)
- read.clipboard.lower, [63](#)
- read.clipboard.tab, [63](#)
- read.clipboard.upper, [63](#)
- read.file, [22](#), [57](#), [59](#), [59](#), [61](#), [62](#), [74](#)
- read.fwf, [61](#)
- read.https (read.file), [59](#)
- read.spss, [61](#), [62](#)
- read.table, [61](#)
- read.xport, [61](#)
- readRDS, [61](#)
- sai, [24](#), [46](#), [50](#), [58](#), [64](#), [65](#)
- saveRDS, [62](#)
- scatterHist, [27](#)
- Schutz, [58](#), [67](#)
- score.items, [7](#)
- scoreItems, [44](#), [50](#)
- scoreOverlap, [44](#), [50](#)
- sim.irt, [22](#)
- Spengler, [58](#), [68](#)
- spengler (Spengler), [68](#)
- Spengler.stat (Spengler), [68](#)
- spi, [58](#), [70](#)

table2df, [17](#), [31](#), [32](#)  
table2matrix, [17](#), [32](#)  
tai, [50](#), [58](#), [65](#)  
tai (sai), [64](#)  
test.irt, [22](#)  
testRetest, [24](#), [50](#)  
tetrachoric, [3](#), [38](#)  
thurstone, [76](#)

USAF (usaf), [72](#)  
usaf, [58](#), [72](#)  
Utility, [73](#)

veg (vegetables), [75](#)  
vegetables, [75](#)

write.file, [59](#), [60](#), [62](#)  
write.file (read.file), [59](#)  
write.file.csv, [62](#)  
write.table, [62](#)