Package ‘rmcorr’

August 25, 2022

Title  Repeated Measures Correlation
Version 0.5.2
Description Compute the repeated measures correlation, a statistical technique for determining the overall within-individual relationship among paired measures assessed on two or more occasions, first introduced by Bland and Altman (1995). Includes functions for diagnostics, p-value, effect size with confidence interval including optional bootstrapping, as well as graphing. Also includes several example datasets. For more details, see the web documentation <https://lmarusich.github.io/rmcorr/index.html> and the original paper: Bakdash and Marusich (2017) <doi:10.3389/fpsyg.2017.00456>.

Depends R (>= 4.1.0)
License GPL-2
LazyData true
Imports stats, grDevices, graphics, psych, RColorBrewer
RoxygenNote 7.2.1
Encoding UTF-8
Suggests knitr, rmarkdown, plotrix, ggplot2, lme4, merTools, pwr, AICcmodavg, pals, testthat (>= 3.0.0), corrplot, cocor
VignetteBuilder knitr

URL https://github.com/lmarusich/rmcorr,
https://lmarusich.github.io/rmcorr/

BugReports https://github.com/lmarusich/rmcorr/issues

Author Jonathan Z. Bakdash [aut] (<https://orcid.org/0000-0002-1409-4779>), Laura R. Marusich [aut, cre] (<https://orcid.org/0000-0002-3524-6110>)

Maintainer Laura R. Marusich <lmarusich@gmail.com>
Repository CRAN
Date/Publication 2022-08-25 14:50:02 UTC
R topics documented:

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rmcorr-package

A package for computing the repeated measures correlation coefficient

Description

Compute the repeated measures correlation, a statistical technique for determining the overall within-individual relationship among paired measures assessed on two or more occasions, first introduced by Bland and Altman (1995). Includes functions for diagnostics, p-value, effect size with confidence interval including optional bootstrapping, as well as graphing. Also includes several example datasets. For more details, see the web documentation <https://lmarusich.github.io/rmcorr/index.html> and the original paper: Bakdash and Marusich (2017) <doi:10.3389/fpsyg.2017.00456>.

References


bland1995

Repeated measurements of intramural pH and PaCO2

Description


Usage

bland1995
**marusich2016_exp2**

**Format**
A data frame with 47 rows and 3 variables

```
[,1] Subject Unique identifier
[,2] pH Potential of hydrogen, acidity to base
[,3] PaCO2 Partial pressure of carbon dioxide
```

**Source**

---

**gilden2010**

**Repeated measurements of reaction time and accuracy**

**Description**
A dataset containing four repeated measurements of reaction time (RT) and accuracy from eleven subjects in a visual search experiment. Each measurement is the mean RT and accuracy from a block of 288 search trials.

**Usage**
gilden2010

**Format**
A data frame with 44 rows and 4 variables

```
[,1] sub Subject ID
[,2] block Block ID
[,3] rt Mean reaction time
[,4] acc Mean accuracy
```

**Source**

---

**marusich2016_exp2**

**Repeated measurements of dyads performance and subjective situation awareness**
**Description**

A dataset containing three repeated measures of dyads (paired participants) working together to capture High Value Targets (lower task time is better performance) and their averaged Mission Awareness Rating Scale (MARS) score for each block, repeated three times. MARS evaluates subjective situation awareness ("knowing what is going on"), higher values indicate better situation awareness.

**Usage**

marusich2016_exp2

**Format**

A data frame with 84 rows (28 dyads/pairs) and 4 variables

```
[,1]  Pair  Unique identifier for each dyad
[,2]  HVT_capture  Capture time
[,3]  MARS  subjective situation awareness
[,4]  Source Reliability  1 = none, 2 = accurate, and 3 = inaccurate
```

**Source**


---

**plot.rmc**

*Plot the repeated measures correlation coefficient.*

**Description**

plot.rmc produces a scatterplot of measure1 on the x-axis and measure2 on the y-axis, with a different color used for each subject. Parallel lines are fitted to each subject’s data.

**Usage**

```r
## S3 method for class 'rmc'
plot(
  x,
  dataset = NULL,
  overall = F,
  palette = NULL,
  xlab = NULL,
  ylab = NULL,
  overall.col = "gray60",
  overall.lwd = 3,
)```
**plot.rmc**

```
overall.lty = 2, #
```

### Arguments

- **x**: an object of class "rmc" generated from the `rmcorr` function.
- **dataset**: Deprecated: This argument is no longer required
- **overall**: logical: if TRUE, plots the regression line between measure1 and measure2, ignoring the participant variable.
- **palette**: the palette to be used. Defaults to the RColorBrewer "Paired" palette
- **xlab**: label for the x axis, defaults to the variable name for measure1.
- **ylab**: label for the y axis, defaults to the variable name for measure2.
- **overall.col**: the color of the overall regression line
- **overall.lwd**: the line thickness of the overall regression line
- **overall.lty**: the line type of the overall regression line
- ... additional arguments to `plot`.

### See Also

- `rmcorr`

### Examples

```r
## Bland Altman 1995 data
my.rmc <- rmcorr(participant = Subject, measure1 = PaCO2, measure2 = pH, dataset = bland1995)
plot(my.rmc)

# using ggplot instead
if (requireNamespace("ggplot2", quietly = TRUE)){
  ggplot2::ggplot(bland1995, ggplot2::aes(x = PaCO2, y = pH, group = factor(Subject), color = factor(Subject))) +
  ggplot2::geom_point(ggplot2::aes(colour = factor(Subject))) +
  ggplot2::geom_line(ggplot2::aes(y = my.rmc$model$fitted.values), linetype = 1)
}

## Raz et al. 2005 data
my.rmc <- rmcorr(participant = Participant, measure1 = Age, measure2 = Volume, dataset = raz2005)
library(RColorBrewer)
blueset <- brewer.pal(8, 'Blues')
pal <- colorRampPalette(blueset)
plot(my.rmc, overall = TRUE, palette = pal, overall.col = 'black')
```
my.rmc <- rmcorr(participant = sub, measure1 = rt, measure2 = acc, 
dataset = gilden2010)
plot(my.rmc, overall = FALSE, lty = 2, xlab = "Reaction Time",
     ylab = "Accuracy")

print.rmc

Print the results of a repeated measures correlation

Description
Print the results of a repeated measures correlation

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

Arguments
x An object of class "rmc", a result of a call to rmcorr.
...
additional arguments to print.

See Also
rmc

Examples
## Bland Altman 1995 data
blandrmc <- rmcorr(Subject, PaCO2, pH, bland1995)
blandrmc

print.rmcmat

Print the repeated measures correlation matrix

Description
Print the repeated measures correlation matrix

Usage
## S3 method for class 'rmcmat'
print(x, ...)
Arguments

- `x` An object of class "rmcmat", a result of a call to `rmcorr_mat`.
- `...` additional arguments to `print`.

See Also

`rmcorr_mat, rmcorr`

Examples

```r
## Bland Altman 1995 data
blandrmc <- rmcorr(Subject, PaCO2, pH, bland1995)
blandrmc
```

### raz2005

**Repeated measurements of age and cerebellar volume**

Description

A dataset containing two repeated measures, on two occasions (Time), of age and adjusted volume of cerebellar hemispheres from 72 participants. Data were captured from Figure 8, Cerebellar Hemispheres (lower right) of Raz et al. (2005).

Usage

`raz2005`

Format

A data frame with 144 rows and 4 variables

<table>
<thead>
<tr>
<th>[,1]</th>
<th>Participant</th>
<th>Participant ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>[,2]</td>
<td>Time</td>
<td>Measurement time</td>
</tr>
<tr>
<td>[,3]</td>
<td>Age</td>
<td>Participant’s age (years)</td>
</tr>
<tr>
<td>[,4]</td>
<td>Volume</td>
<td>Adjusted volume of cerebellar hemispheres (cm^3)</td>
</tr>
</tbody>
</table>

Source


### rmcorr

*Calculate the repeated measures correlation coefficient.*
Description

Calculate the repeated measures correlation coefficient.

Usage

rmcorr(
  participant,
  measure1,
  measure2,
  dataset,
  CI.level = 0.95,
  CIs = c("analytic", "bootstrap"),
  nreps = 100,
  bstrap.out = F
)

Arguments

participant  A variable giving the subject name/id for each observation.
measure1     A numeric variable giving the observations for one measure.
measure2     A numeric variable giving the observations for the second measure.
dataset      The data frame containing the variables.
CI.level     The confidence level of the interval
CIs          The method of calculating confidence intervals.
nreps        The number of resamples to take if bootstrapping.
bstrap.out   Determines if the output include the bootstrap resamples.

Value

A list with class "rmc" containing the following components.

r            the value of the repeated measures correlation coefficient.
df           the degrees of freedom
p            the p-value for the repeated measures correlation coefficient.
CI           the 95% confidence interval for the repeated measures correlation coefficient.
model        the multiple regression model used to calculate the correlation coefficient.
resamples    the bootstrap resampled correlation values.

References


rmcorr_mat

See Also

plot.rmc

Examples

## Bland Altman 1995 data
rmcorr(Subject, PaCO2, pH, bland1995)

---

Create a repeated measures correlation matrix.

Description

Create a repeated measures correlation matrix.

Usage

rmcorr_mat(participant, variables, dataset, CI.level = 0.95)

Arguments

- **participant**: A variable giving the subject name/id for each observation.
- **variables**: A character vector indicating the columns of variables to include in the correlation matrix.
- **dataset**: The data frame containing the variables.
- **CI.level**: The level of confidence intervals to use in the rmcorr models.

Value

A list with class "rmcmat" containing the following components.

- **matrix**: the repeated measures correlation matrix
- **summary**: a dataframe showing rmcorr stats for each pair of variables
- **models**: a list of the full rmcorr model for each pair of variables

References


See Also

rmcorr, plot.rmc
Examples

```r
dist_rmc_mat <- rmcorr_mat(participant = Subject,
                           variables = c("Blindwalk Away",
                                          "Blindwalk Toward",
                                          "Triangulated BW",
                                          "Verbal",
                                          "Visual matching"),
                           dataset = twedt_dist_measures,
                           CI.level = 0.95)
plot(dist_rmc_mat$models[[2]])
```

Description

A dataset of repeated measures of distance perception at physical distances of 7, 8, 9, 10, and 11 meters. The data are also multivariate, with five dependent measures of distance perception. This is a 5 (physical distance) x 5 (dependent measure) within-participants design with a sample size of 46. Note data is missing for 15 trials due participant and experimenter errors.

Usage

twedt_dist_measures

Format

A data frame with 230 rows and 7 columns

|   [,1] Subject | Unique identifier for each participant |
|    [,2] Physical Distance | Physical distance from the participant to the target cone, in meters |
|    [,3] Blindwalk Away | Participants put on the blindfold after viewing the target. Next, participants took one step to the left and turned 180 degrees to the right. Participants were instructed to walk forward until they had walked the original distance to the target cone, in feet and inches |
|    [,4] Blindwalk Toward | Participants put on the blindfold after viewing the target. Next, participants walked forward until they thought they had reached the target cone, in feet and inches |
|    [,5] Triangulated BW | Participants put on the blindfold after viewing the target. Next, participants turned right 90 degrees and walked forward two steps to indicate the direction. Participants were instructed to walk forward until they had walked the original distance to the target cone, in feet and inches |
|    [,6] Verbal | Participants stated the distance between the target cone and themselves, in feet and inches |
|    [,7] Visual Matching | An experimenter stood next to the target cone and walked away from the cone in a straight line that was perpendicular to the line connecting the target cone and the participant. Participants were instructed to walk forward until they thought that the distance between the target and the experimenter was equal to the target distance |

Source

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