Package 'BlandAltmanLeh'

December 23, 2015

Type Package

Title Plots (Slightly Extended) Bland-Altman Plots

Version 0.3.1

Date 2015-12-20

Author Bernhard Lehnert

Maintainer Bernhard Lehnert <bernhard.lehnert@uni-greifswald.de>

Description Bland-Altman Plots using either base graphics or ggplot2,
augmented with confidence intervals, with detailed return values and
a sunflowerplot option for data with ties.

Suggests ggplot2, knitr, ggExtra

License GPL

VignetteBuilder knitr

RoxygenNote 5.0.1

NeedsCompilation no

Repository CRAN

Date/Publication 2015-12-23 23:32:17

R topics documented:

1

BlandAltmanLeh-package

(Slightly extended) Bland-Altman plots BlandAltmanLeh

Description

Bland-Altman Plots for assessing agreement between two methods of clinical measurement and returning associated statistics. Plots are optionally extended by confidence intervals as described in "J. Martin Bland, Douglas G. Altman (1986): Statistical Methods For Assessing Agreement Between Two Methods Of Clinical Measurement" but not included in the graphics of that publication. Either base graphics or ggplot2 can be used.

Details

Package:	BlandAltmanLeh
Type:	Package
Version:	0.3.1
Date:	2015-12-23
License:	GPL

Bland Altman plots are a diagnostic tool for assessing the agreement between two methods of measurement or assessing retest reliability from two measurements. This package offers plots in base and ggplot2 graphics as well as detailed descriptive statistics, thus supporting the construction of individual plots based on Bland Altman plots. Bland and Altman describe a way for constructing confidence intervals. This package computes these confidence intervals and includes them into the plots. It also invents the Sunflower-Bland-Altman plot for data with ties.

Author(s)

Bernhard Lehnert

Maintainer: Bernhard K. Lehnert <bernhard.lehnert@uni-greifswald.de>

References

Bland JM, Altman DG, Statistical Methods For Assessing Agreement Between Two Methods Of Clinical Measurement, Lancet, 1986; 307-310.

Altman DG, Bland JM, Measurement in medicine: the analysis of method comparison studies, The Statistician 1983; 32, 307-317.

Vaz S et al., The Case for Using the Repeatability Coeffcient When Calculating Test-Retest Reliability, PLOS ONE, Sept. 2013, Vol 8, Issue 9.

See Also

bland.altman.plot,bland.altman.stats

Examples

```
# simple basic Bland Altman plot
a <- rnorm(40,30,10)
b <- 1.01*a + rnorm(40)
bland.altman.plot(a,b, xlab="mean", ylab="difference")

# to get all the data for further analysis
bland.altman.plot(a,b, xlab="mean", ylab="difference", silent=FALSE)

# to include confidence intervals into the plot
bland.altman.plot(a,b, xlab="mean", ylab="difference", conf.int=.95)

# to plot in ggplot2
bland.altman.plot(a,b, graph.sys="ggplot2")

# to mark ties in a Sunflower-Bland-Altman plot
a <- sample(1:5, 40, replace=TRUE)
b <- rep(c(1,2,3,3,5,5,5,5),5)
bland.altman.plot(a, b, sunflower=TRUE)
```

---

bland.altman.PEFR   *PEFR Data from Bland JM and Altman DG 1986*

Description

Peak expiratory flow data from 17 members of Bland's family, taken with two different instruments, each twice. This data is for explanatory use only. Columns 1 and 2 were measured with the "Wright" peak flow meter, columns 3 and 4 with the "Mini Wright" peak flow meter. These are the data behind fig. 1, fig. 2 and fig. 6 of the original paper and these can be easily reconstructed

Usage

```
bland.altman.PEFR
```

Format

An object of class data.frame with 17 rows and 4 columns.

Examples

```
# this is what fig. 1. would have looked like in R:
x <- bland.altman.PEFR[["bigger.first"]]
y <- bland.altman.PEFR[["smaller.first"]]
plot(x,y, xlab="PEFR by large meter",ylab="PEFR by mini meter",
     xlim=c(0,800), ylim=c(0,800))
abline(0,1)
```

| bland.altman.plot | *Produce Bland-Altman Plot Bland-AltmanPlots for assessing agreement between two measuring methods or repeatability (test-retest agreement) of measurements. Using either base graphics or ggplot2.* |

Description

Produce Bland-Altman Plot

Bland-AltmanPlots for assessing agreement between two measuring methods or repeatability (test-retest agreement) of measurements. Using either base graphics or ggplot2.

Usage

```
bland.altman.plot(group1, group2, two = 1.96, mode = 1,
  graph.sys = "base", conf.int = 0, silent = TRUE, sunflower = FALSE,
  geom_count = FALSE, ...)
```

Arguments

group1	Measurements with first method or first measurement
group2	Measurements with second method or second measurement
two	Lines are drawn "two" standard deviations from mean differences. This defaults to 1.96 for proper 95 percent confidence interval estimation but can be set to 2.0 for better agreement with e. g. the Bland Altman publication.
mode	if 1 then difference group1 minus group2 is used, if 2 then group2 minus group1 is used. Defaults to 1.
graph.sys	Graphing system within R. This defaults to "base" but can be one out of c("base", "ggplot2"), providing ggplot2 is installed.
conf.int	Defaults to 0 which draws the usual Bland Altman plot which contains no confidence intervalls. Change to .95 for 95 percent confidence intervalls to be drawn.
silent	logical. If graph.sys=="base" and silent==TRUE then no return value. If graph.sys=="base" and silent==FALSE then returns statistics.
sunflower	logical. If TRUE, the plot will be based on a sunflower plot and ties will be marked accordingly. Try with data with ties. Works only with graph.sys=="base".
geom_count	logical. If TRUE, the dots will get larger the more frequent given pair is. Use in presence of ties. Works only with graph.sys=="ggplot2" version >=2.0.0.
...	passed on to graphics functions if graph.sys=="base"

Value

Depends on graphic system chosen. In case of "base" depending on whether silent==TRUE. If silent==TRUE then no returns. If silent==FALSE than returns list of statistics as returned by bland.altman.stats(). In case the graphics system is "ggplot2" than the graphic object is returned so that it can be printed or altered.

Author(s)

Bernhard Lehnert <bernhard.lehnert@uni-greifswald.de>

See Also

[bland.altman.stats](#)

Examples

```
bland.altman.plot(rnorm(20), rnorm(20), xlab="mean measurement",
                  ylab="differences", main="Example plot")

bland.altman.plot(rnorm(20), 2+.8*rnorm(20), xlab="mean measurement",
                  ylab="differences", conf.int=.95)

bland.altman.plot(rnorm(200), 2+.8*rnorm(200), xlab="mean measurement",
                  ylab="differences", conf.int=.95)

# this is what fig.2 in Bland&Altman1986 would have looked like
PEFR1 <- bland.altman.PEFR[,1]
PEFR2 <- bland.altman.PEFR[,3]
bland.altman.plot(PEFR1, PEFR2, silent=TRUE, xlim=c(0,800),
                  xlab="Average PEFR by two meters",
                  ylab="Difference in PEFR (large-mini)")

# and this is the same but with additional 95 percent CIs
data(bland.altman.PEFR)
bland.altman.plot(PEFR1, PEFR2, silent=TRUE, conf.int=.95, xlim=c(0,800))

# an example with many ties and the 'sunflower'-option
a <- rep(c(1,1,2,2,2,2,2,2,2,2,3,3,3,3,3,3,3,3,4,4,4,5,6,6),2)
b <- rep(c(1,1,1,2,2,2,3,1,4,2,5,3,3,3,3,3),3)
bland.altman.plot(a,b,sunflower=TRUE, xlab="Mean",ylab="Difference",
                  main="discrete values lead to ties")

library(ggplot2)
a <- bland.altman.plot(rnorm(20), rnorm(20), graph.sys="ggplot2", conf.int=.9)
print(a + xlab("you can change this later") + ggtitle("Title goes here"))
```

---

bland.altman.stats   *Calculate statistics for Bland-Altman-Plot*

Description

Does the computation for Bland Altman plots. This will usually be called from graphic functions like `bland.altman.plot` but will be usefull for customized plot (see examples for color coded BA plot). Offers symmetric confidence intervals for bias and upper and lower limits.

Usage

```
bland.altman.stats(group1, group2, two = 1.96, mode = 1, conf.int = 0.95)
```

Arguments

group1	vector of numerics to be compared to group2
group2	vector of numerics to be compared to group1
two	numeric defines how many standard deviations from mean are to be computed, defaults to 1.96 as this gives proper 95 percent CI. However, in the original publication a factor of 2 is used.
mode	if 1 then difference group1 minus group2 is used, if 2 then group2 minus group1 is used. Defaults to 1.
conf.int	usefull

Value

means vector of means, i. e. data for the x axis

diffs vector of differences, i. e. data for the y axis

groups data.frame containing pairwise complete cases of group1 and group2. NAs are removed.

based.on count of pairwise complete cases in groups

lower.limit lower limit for BA plot

mean.diffs mean of differences, also called 'bias'

upper.limit upper limit for BA plot

lines vector containing y values where to draw horizontal lines, i. e. mean of differences minus "two" standard deviations, mean of differences and mean of differences plus "two" standard deviations (i. e. c(lower.limit, mean.diffs, upper.limit). This is convenient for printing.

CI.lines vector of confidence intervalls for the values of lines (based on the assumption of normal distribution of differences diffs).

two the argument 'two'

critical.diff critical difference, i. e. 'two' times standard deviation of differences, equals half the difference of lower.limit and upper.limit

Author(s)

Bernhard Lehnert <bernhard.lehnert@uni-greifswald.de>

See Also

bland.altman.plot

Examples

```
# simple calculation of stats:
a <- rnorm(20)
b <- jitter(a)
print(bland.altman.stats(a, b))
print(bland.altman.stats(a, b)$critical.diff)

# drawing Bland-Altman-Plot with color coding sex:
example.data <- data.frame(sex = gl(2,6,labels=c("f","m")),
                m1 = c(16,10,14,18,16,15,18,19,14,11,11,17),
                m2 = c(18, 9,15,19,19,13,19,20,14,11,13,17))
ba <- bland.altman.stats(example.data$m1, example.data$m2)
plot(ba$means, ba$diffs, col=example.data$sex, ylim=c(-4,4))
abline(h=ba$lines, lty=2)

# compute 95%-CIs for the bias and upper and lower limits of PEFR data as
# in Bland&Altman 1986
bland.altman.stats(bland.altman.PEFR[,1],bland.altman.PEFR[,3])$CI.lines
# apparently wrong results? CAVE: Bland&Altman are using two=2, thus
bland.altman.stats(bland.altman.PEFR[,1],bland.altman.PEFR[,3], two=2)$CI.lines
```

Index