Package 'audiometry'

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Type Package

Title Standard Conform Pure Tone Audiometry (PTA) Plots

Version 0.3.0

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Description Facilitates plotting audiometric data (mostly) by preparing the coordinate system according to standards, given e. g. in American Speech-Language-Hearing Association (2005), <doi:10.1044/policy.GL2005-00014>.

Imports ggplot2

License GPL-3

Encoding UTF-8

RoxygenNote 7.1.1

Suggests knitr, rmarkdown, ggbeeswarm, ggthemes

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

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R topics documented:

audiometry *audiometry*

Description

a package for standard confirm pur tone audiomety data visualisation using the versatile ggplot2 package.

Details

Right now this is almost only about the gg_pta function to start a ggplot with pure tone audiometry data so that the reference frame looks familiar to audiologists and ent doctors.

boltzmann *Boltzmann's function*

Description

s-shaped curve , originally used as discrimination function to draw the "normal" curves in the Freiburger Sprachtest before I could find the official norm values. Could still be usefull for someone seeking to add something like that to her plots be it as example or for simulation. The function is given as y = (exp(-4*(L-L_50))*s_50)^-1 this is similar to a logistic regression result but with parameterization that is expecially usefull here:

Usage

```
boltzmann(L, L_50 = 18.4, s_50 = 0.08)
```

Arguments

L	sound pressure level for which the intelligibility is to be computed
L_50	sound pressure level at 50% intelligibility
s_50	intelligibility at L_50, happens to be 8% in Freiburger Zahlentest and 5% in Freiburger Einsilbertest (values taken from S. Hoth, Der Freiburger Sprachtest, HNO 2016, 64:540-48).

Value

predicted intelligibility

Examples

```
# Freiburger Einsilbertest has L_50 = 29.3 dB and s_50 at 5 %/dB.
# Compute the expected intelligibility at 20, 30 and 40 dB SPL

boltzmann(L = c(20, 30, 40), L_50 = 29.3, s_50 = .05)
```

gg_freiburg *Freiburger Sprachtest data with ggplot2*

Description

Draws the most influential speech intelligibility test in German speaking countries. This function serves as a starting point for plotting data in way that reflects the usual representation of Freiburger Sprachtest results.

Usage

```
gg_freiburg(
  data = data.frame(),
  mapping = aes(),
  horizontal = FALSE,
  xlab = "Sprachschallpegel [dB]",
  ylab = "Sprachverstehen [%]",
  x_ticks_at = seq(0, 110, 10),
  y_ticks_at = seq(0, 100, 20),
  plot_reference = TRUE,
  plot_reference_lwd_1 = 0.8,
  plot_reference_lwd_2 = 0.8,
  plot_reference_color_1 = "darkgrey",
  plot_reference_color_2 = "darkgrey",
  plot_discr_loss_scale = TRUE,
  plot_discr_loss_scale_values = seq(0, 90, 10),
  plot_discr_loss_scale_color = "darkgrey",
  NC_alpha = NULL,
  HV_color = NULL
)
```

Arguments

data	a data.frame that is given to ggplot for initialization
mapping	same as mapping in ggplot2::ggplot
horizontal	logical whether to orient the plot horizontally
xlab	label on the x axis
ylab	label on the y axis
x_ticks_at	vector of x values where numbers on x axis should appear. This is seq(0, 110, 10) in the DIN but c(0, seq(5, 120, 15)) in Muster 13.
y_ticks_at	corresponding to x_ticks_at for the y axis. Set to seq(0,100,10) to mimick the DIN, seq(0, 100, 20) to mimick Muster 13.
plot_reference	logical whether to plot the normal hearing curves for numbers and syllables
plot_reference_lwd_1	line width for reference line 1

plot_reference_lwd_2
: line width for reference line 2

plot_reference_color_1
: line color for reference line 1

plot_reference_color_2
: line color for reference line 2

plot_discr_loss_scale
: logical whether to print discrimination loss values in the middle of the plot (likely to change in later versions)

plot_discr_loss_scale_values
: numeric vector of discrimination loss values (likely to change in later versions)

plot_discr_loss_scale_color
: color value of discrimination loss values (likely to change in later versions)

NC_alpha
: deprecated parameter that was used only in version 0.2.0

HV_color
: deprecated parameter that was used only in version 0.2.0

Value

a ggplot suitable for adding Freiburger Sprachtest data as geom_*

Examples

```
library(ggplot2)
data.frame(loud = c(20, 35, 50, 65), perc = c(0,10,65,100)) |>
gg_freiburg(aes(x = loud, y = perc)) +
  geom_point() +
    geom_line()


id = gl(25,4)
gender=gl(2,25, label =c("Frauen", "M\u00e4nner"))
x = rep(c(35, 50, 65, 80), 25)
y = 100*boltzmann(jitter(x,3), 45, .03)
example <- data.frame(Patient=id, Geschlecht = gender, x=x, y=y)
p <- gg_freiburg() +
        geom_boxplot(aes(x = x, y = y, group = x), example) +
        geom_line(aes(x = x, y = y, color = Geschlecht, group = id), example)
print(p)

gg_freiburg(plot_reference_lwd_1 = 2.5, plot_reference_lwd_2 = 3,
           plot_reference_color_1 = "green", plot_reference_color_2 = "pink")
```

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gg_pta *Make a primer for pure tone audiograms with ggplot2*

Description

Call this to start building a plot based on pure tone audiometry.

Usage

```
gg_pta(
  data = data.frame(),
  theme = theme_light,
  lettermark = NULL,
  lettermarksize = 30,
  xlab = "Frequency in Hertz (Hz)",
  ylab = "Hearing Levels in Decibels (dB)",
  xlim = c(125, 8000),
  xbreaks = c(125, 250, 500, 1000, 2000, 4000, 8000),
  minor_xbreaks = c(750, 1500, 3000),
  x_base_lwd = 1,
  xlabels = c("125", "250", "500", "1000", "2000", "4000", "8000"),
  ylim = c(120, -10),
  yposition = "left"
)
```

Arguments

`data`	data.frame that contains the data, later to be added to the plot. If no such data.frame is available, can be data = data.frame(0)
`theme`	theme for plotting in ggplot2. Can be set to NULL. A different theme can always be added later
`lettermark`	either "R" or "L" or c("R", "L") to add a letter describing the left or right side (see lettermarksize)
`lettermarksize`	size of letter for lettermark
`xlab`	string containing the x axis label
`ylab`	string containing the y axis label
`xlim`	limits of the frequencies displayed at the x axis.
`xbreaks`	frequencies at which major line breaks should be drawn. Must be of same length as `xlabels`
`minor_xbreaks`	frequencies at which minor line breaks should be drawn
`x_base_lwd`	if positive, a line to mark the 0 dB threshold level is drawn, the line width of which is given by x_base_lwd. Set to -1 to turn the line of
`xlabels`	vector of strings as frequency axis labels. Must be of same length as `xbreaks`.
`ylim`	limits of the decibels on the y axis
`yposition`	side on which to label the y axis: either "right" or "left"

Details

This function is called instead of ggplot2::ggplot with a data.frame and will return a ggplot with fixed axes, fixed axis ratio, ...

Value

a ggplot with standard axis ratio, given axis etc. to add geoms to

Author(s)

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Examples

```
library(ggplot2)
fig1 <- gg_pta(data.frame())
print(fig1)

fig2 <- gg_pta(data.frame(), xlab="Frequency [Hz]", xlim=c(125,12000),
               xbreaks = c(125, 250, 500, 1000, 2000, 4000, 8000, 12000),
               xlabels = c("125", "250", "500", "1k", "2k", "4k", "8k", "12k"))
print(fig2)

expl <- data.frame(x=rep(c(500, 1000, 2000, 4000), 200),
                   y=5 + 70*rbeta(200,1,5))
fig3 <- gg_pta(expl, lettermark = "R",
               xlab="frecuencia", ylab="volumen") +
             geom_boxplot(aes(x=x, y=y, group=x)) +
             theme_grey()
print(fig3)
```

Index