

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

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audiometry

audiometry

Description

a package for standard confirm pur tone audiometry 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 $y = (\exp(-4 \cdot (L - L_{50})) \cdot s_{50})^{-1}$ 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)
```

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

<code>data</code>	a data.frame that is given to ggplot for initialization
<code>mapping</code>	same as mapping in ggplot2::ggplot
<code>horizontal</code>	logical whether to orient the plot horizontally
<code>xlab</code>	label on the x axis
<code>ylab</code>	label on the y axis
<code>x_ticks_at</code>	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.
<code>y_ticks_at</code>	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.
<code>plot_reference</code>	logical whether to plot the normal hearing curves for numbers and syllables
<code>plot_reference_lwd_1</code>	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")

```

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()
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)
```

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