Package 'NormPsy'

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Type Package

Title Normalisation of Psychometric Tests

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Description Functions for normalizing psychometric test scores. The normalization aims at correcting the metrological properties of the psychometric tests such as the ceiling and floor effects and the curvilinearity (unequal interval scaling). Functions to compute and plot predictions in the natural scale of the psychometric test from the estimates of a linear mixed model estimated on the normalized scores are also provided. See Philipps et al (2014) <doi:10.1159/000365637> for details.

License GPL

Depends R (>= 2.14.0)

Imports lcmm (>= 1.7.1), utils

NeedsCompilation yes

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Contents

NormPsy-package *Normalisation of Psychometric Tests*

Description

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Author(s)

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ForInternalUse *For internal use only ...*

Description

For internal use only ...

normMMSE *Normalized scores for the Mini Mental State Examination (MMSE)*

Description

This function transforms crude MMSE scores (range 0 - 30) into normalized scores. The normalized scale ranges from 0 to 100, with MMSE minimum score 0 being transformed into 0 and MMSE maximum score 30 into 100. The normalization preserves the ranking of the test but transforms the gaps between two consecutive values in order to correct the curvilinearity of MMSE. The normalization is specifically adapted for heterogeneous elderly populations mixing normal and pathological aging.

Usage

```
normMMSE(x)
```

Arguments

x	a numeric vector containing MMSE scores (integer between 0 and 30)

Value

a vector containing the transformed MMSE scores

Author(s)

Cecile Proust-Lima, Viviane Philipps

References

Philipps, V. and Amieva, H. and Andrieu, S. and Dufouil C.and Berr, C. and Dartigues, J-F and Jacqmin-Gadda, H. and Proust-Lima, C (2014). Normalized MMSE for assessing cognitive change in population-based aging studies. NeuroEpidemiology 43, 15-25.

Examples

```
#import data paquid from lcmm package
library(lcmm)
data(paquid)

# computation of the normalized MMSE
paquid$MMSEnorm <- normMMSE(paquid$MMSE)

# histogram of these data
par(mfrow=c(1,2))
hist(paquid$MMSE,breaks=seq(-0.5,30.5,1),col=2,main="crude MMSE")
hist(paquid$MMSEnorm,breaks=seq(0,100,10),col=3,main="normalized MMSE")
```

plot.predMMSE *Plot of predicted scores in the natural scale of the psychometric test*

Description

This function plots the predicted trajectories obtained with predMMSE function.

Usage

```
## S3 method for class 'predMMSE'
plot(x, legend.loc = "topright", legend, add = FALSE, ...)
```

Arguments

x	a predMMSE object
legend.loc	keyword for the position of the legend from the list "bottomright", "bottom", "bottomleft", "left", "topleft","top", "topright", "right" and "center". By default, the legend is located in the top right of the plot.
legend	character or expression to appear in the legend. If no legend should be added, legend should be NULL.
add	optional logical indicating if the curves should be added to an existing plot (add=TRUE) or if a new plot should be created (add=FALSE). By default, add is FALSE.
...	other parameters to be passed through to plotting functions or to legend

Author(s)

Cecile Proust-Lima, Viviane Philipps

See Also

predictMMSE,normMMSE

Examples

```
#import data paquid from lcmm package
library(lcmm)
data(paquid)

#normalization of MMSE scores
paquid$MMSEnorm <- normMMSE(paquid$MMSE)

#estimation of a linear mixed model on the normalized data
m <- hlme(MMSEnorm~I(age-65)*CEP, random=~I(age-65), subject="ID", data=paquid)

#prediction of MMSE scores in the 0-30 scale
pred <- predictMMSE(m,VarTime="age",Timelim=c(65,85),nTime=30,
```

```
Xprofile=c(CEP=1),methInteg='MC',nsim=200,draws=FALSE)

#plot of the predictions
plot(pred)
```

---

predictMMSE *Prediction of MMSE scores in their natural scale.*

Description

From the estimates of a linear mixed model applied on normalized MMSE scores, the function computes the predicted values of MMSE in its natural 0-30 scale. The function also provides 95% confidence intervals computed by a Monte Carlo method.

Usage

```
predictMMSE(model, VarTime, Timelim, nTime, Xprofile,
methInteg = "GH", nsim = 20, draws = FALSE, ndraws = 2000)
```

Arguments

model	a hlme object representing a latent class linear mixed model
VarTime	a character string containing the name of the time variable in the model
Timelim	a numeric vector indicating the time limits of the prediction
nTime	an integer indicating the number of prediction times
Xprofile	a named vector containing the values of the model's covariate
methInteg	integration method used to compute the numerical integration. If 0 or 'GH' (the default) a Gauss-Hermite numerical approximation is employed. Value 1 or 'MC' specifies a Monte Carlo method.
nsim	number of integration points used for the integration method specified in argument methInteg
draws	optional logical indicating if 95% confidence intervals of the predictions should be calculated. If TRUE, the posterior distribution of the predicted values is approximated by a Monte Carlo method. The predicted value is given by the median value, and the confidence interval is given by the 2.5% and 97.5% percentiles of this distribution. If FALSE (the default), a point prediction is provided.
ndraws	optional integer indicating the number of draws in the Monte Carlo approximation if draws=TRUE.

Value

a predMMSE object consisting in a matrix containing the prediction time, the predicted values and, if draws=TRUE, the lower and upper limits of the confidence interval.

Author(s)

Cecile Proust-Lima, Viviane Philipps

See Also

plot.predMMSE,normMMSE

Examples

```
#import data paquid from lcmm package
library(lcmm)
data(paquid)

# computation of the normalized MMSE
paquid$MMSEnorm <- normMMSE(paquid$MMSE)

# estimation of a model on the normalized MMSE scores
m <- hlme(MMSEnorm~I(age-65)*CEP, random=~I(age-65), subject="ID", data=paquid)

# prediction from the model in the natural scale of MMSE
predictMMSE(m,VarTime="age",Timelim=c(65,85),nTime=30,
Xprofile=c(CEP=1),methInteg='MC',nsim=200,draws=FALSE)
```

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