Package 'test2norm'

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Type Package

Title Normative Standards for Cognitive Tests

Version 0.1.1

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Description Function test2norm() generates formulas for normative standards applied to cognitive tests. It takes raw test scores (e.g., number of correct responses) and converts them to scaled scores and demographically adjusted scores, using methods described in Heaton et al. (2003) <doi:10.1016/B978-012703570-3/50010-9> & Heaton et al. (2009, ISBN:9780199702800). The scaled scores are calculated as quantiles of the raw test scores, scaled to have the mean of 10 and standard deviation of 3, such that higher values always correspond to better performance on the test. The demographically adjusted scores are calculated from the residuals of a model that regresses scaled scores on demographic predictors (e.g., age). The norming procedure makes use of the mfp() function from the 'mfp' package to explore nonlinear associations between cognition and demographic variables.

License CPL (>= 2)

Encoding UTF-8

LazyData true

Imports mfp

Depends R (>= 2.10)

RoxygenNote 6.1.1

NeedsCompilation no

Repository CRAN

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R topics documented:

`PsychTestData` *Neuropsychological test data*

Description

A simulated data containing raw test scores and demographic characteristics for 250 persons, 200 in the control group and 50 in the test group. The raw test scores are to be converted to demographically corrected normed scores, adjusting for effects of age and sex. The control group is used to generate the norming formulas, which are then applied to all scores.

Usage

```
PsychTestData
```

Format

A data frame with 250 rows and 4 variables:

rawscore raw test score on a neuropsychological test, ranging 0-36, with higher values indicating better test performance

age age of the participant, in years

sex sex of the participant, male (M) or female (F)

group norming group the participant belongs to (control or test)

Examples

```
data(PsychTestData)
test2norm(data = PsychTestData, test = "rawscore",
          test.min = 0, test.max = 36, test.better = "High",
          group.id = "group", control.id = "control",
          demographics = c("age", "sex"))
```

`test2norm` *Convert raw neuropsychological test scores to demographically adjusted norms.*

Description

Convert raw neuropsychological test scores to demographically adjusted norms.

Usage

```
test2norm(data = NULL, test = NULL, test.min = NULL,
  test.max = NULL, test.better = c("High", "Low"), group.id = NULL,
  control.id = NULL, all.controls = FALSE, demographics = NULL,
  mfp.alpha = 1, rnd.s = TRUE, rnd.a = TRUE, mean.a = 50,
  sd.a = 10)
```

Arguments

data	a data frame containing the variables needed for the norming process
test	a character string specifying the name of the test to be normed
test.min	a real number indicating the smallest possible test score
test.max	a real number indicating the largest possible test score
test.better	a character string indicating direction of the scores. Use "High" if high test scores imply better performance, use "Low" otherwise.
group.id	a character string specifying the name of the variable containing group identification (i.e. control vs exposed/test/risk). Ignored, if all.controls = TRUE.
control.id	a character string specifying the label of the control group within group.id variable. Ignored, if all.controls = TRUE.
all.controls	a logical indicating whether all observations should be treated as controls. Overwrites group.id and control.id.
demographics	a single or multiple character strings (concatenated by c() function) specifying the names of demographic predictors to be included into normative formulas.
mfp.alpha	a numeric value between 0 and 1 that sets significance level for inclusion of demographic predictors into normative formula. Passed to the mfp() function. Default value is 1 for inclusion of all predictors, regardless of their significance.
rnd.s	a logical indicating whether the scaled scores should be rounded. Default is TRUE.
rnd.a	a logical indicating whether the adjusted scores (T-scores) should be rounded. Default is TRUE.
mean.a	numeric value for the mean of adjusted score (T-score) distribution.
sd.a	numeric value for the standard deviation of adjusted score (T-score) distribution.

Details

The `test2norm()` function can be used by neuropsychologists, who wish to construct normative formulas for cognitive tests that adjust for expected effects of demographic characteristics (e.g., age), using methods described in Heaton et al. (2003 & 2009). The norming procedure makes use of the `mfp()` function from the `mfp` package to explore nonlinear associations between cognition and demographic variables. The raw test scores that have many decimal digits should be rounded to fewer digits prior to the application of the `test2norm()` function. This will significantly reduce software running time. The recommended number of decimal digits is 4 or fewer. Detailed description of the procedure will be found in Umlauf et al (2019).

Value

A list consisting of 6 objects. The first four are vectors containing the original raw test scores and the calculated scaled scores, demographically adjusted scores, and deficit scores. The fifth object in the list, called `SS.maps`, contains conversions from raw scores to scaled scores in a form of a table with two columns, one representing scaled scores (one per row) and one representing raw scores (range of raw values corresponding to each scaled score). The last item in the output list is also a list called `MFP.formulas` and contains the information for calculation of adjusted scores, including variable transformations (if any), multiple fractional polynomial (MFP) model coefficients, and the standard deviation of residuals resulting from the MFP modeling.

Author(s)

Anya Umlauf

References

Umlauf A et al (2019) Automated procedure to produce normative correction formulas modeling demographic effects on cognitive test scores and apply them to obtain demographically corrected scores. Manuscript submitted for publication.

Heaton RK, Taylor MJ, & Manly J (2003) Demographic effects and use of demographically corrected norms with the WAIS-III and WMS-III. In: Tulsky D et al. (Eds.) *Clinical Interpretation of the WAIS-III and WMS-III*. San Diego, CA: Academic Press, 183-210.

Heaton RK, Ryan L, & Grant I (2009) Demographic influences and use of demographically corrected norms in neuropsychological assessment. In Grant I & Adams KM (Eds.) *Neuropsychological Assessment of Neuropsychiatric and Neuromedical Disorders*. New York, NY: Oxford University Press, 127-155.

Benner A (2005) mfp: Multivariable fractional polynomials. *R News* 5(2): 20–23.

Examples

```
data(PsychTestData)
test2norm(data = PsychTestData, test = "rawscore",
          test.min = 0, test.max = 36, test.better = "High",
          group.id = "group", control.id = "control",
          demographics = c("age", "sex"))
```

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