Package 'exhaustiveRasch'

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Type Package

Title Item Selection and Exhaustive Search for Rasch Models

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Description Automation of the item selection processes for Rasch scales by means of exhaustive search for suitable Rasch models (dichotomous, partial credit, rating-scale) in a list of item-combinations. The item-combinations to test can be either all possible combinations or item-combinations can be defined by several rules (forced inclusion of specific items, exclusion of combinations, minimum/maximum items of a subset of items). Tests for model fit and item fit include ordering of the thresholds, item fit-indices, likelihood ratio test, Martin-Löf test, Wald-like test, person-item distribution, person separation index, principal components of Rasch residuals, empirical representation of all raw scores or Rasch trees for detecting differential item functioning. The tests, their ordering and their parameters can be defined by the user. For parameter estimation and model tests, functions of the packages 'eRm', 'psychotools' or 'pairwise' can be used.

License GPL-3

Encoding UTF-8

LazyData true

Imports eRm, psychotree, parallel, stats, utils, psych, tictoc, methods, psychotools, pairwise, arrangements, pbapply

Depends R (>= 3.5.0)

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

VignetteBuilder knitr

RoxygenNote 7.3.2

URL https://github.com/chrgrebe/exhaustiveRasch

BugReports https://github.com/chrgrebe/exhaustiveRasch/issues

NeedsCompilation no

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Contents

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add_ICs	*adds information criteria to the @IC slot of an object of class [passed_exRa-class](#)*

Description

adds information criteria to the @IC slot of an object of class passed_exRa-class

Usage

```
add_ICs(obj, ignoreCores = 1)
```

Arguments

obj	an object of class passed_exRa-class
ignoreCores	a numeric value for the number of virtual CPU cores (threads)to hold out in computing the information criteria.

Value

an object of [passed_exRa-class](#).

Examples

```
library(exhaustiveRasch)
data(ADL)
passed <- exhaustive_tests(dset= ADL[c(1:4,7,12,14)],
  modelType= "RM", scale_length= 5, alpha=0.05,
  tests=c("test_LR", "test_itemfit", "test_respca"),
  splitcr_LR = ADL[,17], itemfit_param =
    itemfit_control(use.pval=FALSE, upperMSQ=1.5, lowerMSQ=0.5),
  estimation_param= estimation_control(
    est="psychotools"), verbose=FALSE)
passed <- add_ICs(passed)
```

ADL *Activities of Daily Living - dichotomous example data*

Description

ADL date from N=591 nursing home residents from Germany

Usage

```
ADL
```

Format

Activities of Daily Living (V06-V39: 1= yes; 0= no):

- V06: Transfer from bed independently.
- V07: Stand up from a chair/wheelchair independently.
- V08: Walk independently.
- V09: Stand independently.
- V11: micro-change positions in bed independently.
- V12: completely change position in bed independently.
- V22: Wash at a washbasin independently (without back and feet).
- V23: Wash back and feet independently
- V24: Take a shower independently
- V25: dress and undress the upper body independently
- V26: put on shoes and stockings independently
- V27: take a meal independently

- V28: drink independently from a prepared cup
- V36: use the toilet independently
- V39: intimate hygiene independently
- age: age (1= <65; 2= 65-74; 3= 75-84; 4= 85-94; 5= >=95)
- sex: age (1= female; 2= male)

Source

Data from Grebe (2013)

References

Grebe C (2013). Pflegeaufwand und Personalbemessung in der stationären Langzeitpflege: Entwicklung eines empirischen Fallgruppensystems auf der Basis von Bewohnercharakteristika. 3-Länder-Konferenz Pflege & Pflegewissenschaft, Konstanz.

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apply_combo_rules   *selects item combinations based on defined rules*

Description

selects item combinations based on defined rules

Usage

```
apply_combo_rules(
  full,
  combo_length = 4:length(full),
  forced_items = NULL,
  rules = NULL,
  ignoreCores = 1
)
```

Arguments

full	a numeric vector containing the the source for the combinations, typically the indices of the items in the referring dataset
combo_length	a numeric vector with the allowed lengths of the selected combinations (scale lengths)
forced_items	a numeric vector of items that are forced to occur in every selected combination
rules	a list defining rules for combination selection
ignoreCores	number of cpu cores (threads) to be ignored during parallized processing.

Value

a list of numeric vectors containing the selected item combinations that match the defined rules of
forced_items and/or rules.

Examples

```
data(ADL)
forced <- c(1)
rules_object <- list() # rules-Object
rules_object[[1]] <- list("min", 1, 8:9)
rules_object[[2]] <- list("min", 1, 14:15)
rules_object[[3]] <- list("max", 2, 2:6)
rules_object[[4]] <- list("forbidden", c(8,9))
final_combos <- apply_combo_rules(combo_length = 5:7,
                                  full=1:length(ADL),
                                   forced_items = forced,
                                   rules= rules_object)
```

---

cognition	*cognition - polytomous example data data measured with the FACT-cog (subscale perceived cognitive functioning) sample size: N=1009*

Description

cognition - polytomous example data data measured with the FACT-cog (subscale perceived cognitive functioning) sample size: N=1009

Usage

```
cognition
```

Format

Items 1-20: FACT-cog Items. Questions starting with In the past 7 days... Answer categories: 0=
never; 1= about once a week; 2= two to three times a week; 3=nearly every day; 4= several times a
day

- A1_CogA1: I have had trouble forming thoughts
- A3_CogA3: My thinking has been slow
- C7_PC8: I have had trouble concentrating
- M9_PC10: I have had trouble finding my way to a familiar place
- M10_PC11: I have had trouble remembering where I put things, like my keys or my wallet
- M12_NQCOG68: I have had trouble remembering new information, like phone numbers or simple instructions
- V13_PC14: I have had trouble recalling the name of an object while talking to
- V15_PC16: I have had trouble finding the right word(s) to express

- V16_CogV16: I have used the wrong word when I referred to an object
- V17_CogV17b: I have had trouble saying what I mean in conversations with others
- F19_NQCOG69: I have walked into a room and forgot what I meant to get or do there
- F23_NQCOG77: I had to work really hard to pay attention or I would make a mistake.
- F24_PC26: I have forgotten names of people soon after being introduced
- F25_PC28: My reactions in everyday situations have been
- C31_PC36: I have had to work harder than usual to keep track of what I was
- C32_PC37: My thinking has been slower than usual
- C33a_PC38: I have had to work harder than usual to express myself clearly
- C33c_PC40: I have had to use written lists more often than usual so I would not forget things
- MT1_PC41: I have had trouble keeping track of what I was doing when interrupted
- MT2_PC42: I have had trouble shifting back and forth between different activities that require thinking
- CogPCI: Subscale Score: Percieved Cognitive Impairments (CogPCI), Range 0-72
- SD1: What is your age?
- SD2: What is your gender? (1= male; 2= female)
- SD3: Are you of Hispanic, Latino, or Spanish origin? (0= no; 1= yes)
- SD4: In which country were you born? (1= United States of America; 2= Mexico; 3= Canada; 4= United Kingdom; 5= other)
- SD6: What is the HIGHEST level of school or degree you have completed? (1= Less than High School Degree; 2= High School Diploma or General Education Diploma (GED); 3= Some college courses/Technical degree/ Vocational program/Associate degree; 4= College degree/advanced degree (Bachelors, Masters, Doctorate))
- SD7: In the past 30 days, have you used or taken medication for which a prescription is needed? Include only those products prescribed by a health professional such as a doctor or dentist. (0= no; 1= yes)
- SD8: How many different times did you stay in any hospital overnight or longer during the past 12 months?
- SD9: During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities such as self-care, work, or recreation?

Source

Data for perceived cognitive functioning from the PROsetta Stone Wave 2 dataset.

References

Cella D (2017). PROsetta Stone Wave 2. Harvard Dataverse. DOI: 10.7910/DVN/WZVYZI.

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estimation_control *options for item parameter estimation*

Description

options for item parameter estimation

Usage

```
estimation_control(
  est = "psychotools",
  resp.cat = NULL,
  use.thurst = TRUE,
  splitseed = NULL
)
```

Arguments

est	a character value defining the estimation function to use. Possible values: 'psychotools', 'eRm', 'pairwise'.
resp.cat	number of response (answer) categories for all items. If not given, they will be calculated from the data, assuming that every response category is at least once present in the data. Currently only used for pairwise estimations (m parameter in 'pairwise::pair').
use.thurst	a boolean value defining whether thurstonian threshold parameters (TRUE, default) or Rasch-Andrich thresholds (step parameters) will be computed.
splitseed	a numeric value, the seed for random splits in test_waldtest, lest_LR (both only relevant for 'pairwise' or 'psychotools' estimations) and test_mloef (only 'psychotools' estimations)

Value

a list containing the options

---

exhaustive_tests *(main function) Runs exhaustive tests*

Description

(main function) Runs exhaustive tests

Usage

```
exhaustive_tests(
  dset,
  modelType = "PCM",
  combos = NULL,
  scale_length = 4:length(dset),
  na.rm = TRUE,
  tests = c("no_test"),
  splitcr_mloef = NULL,
  splitcr_LR = NULL,
  splitcr_wald = NULL,
  icat_wald = FALSE,
  alpha = 0.1,
  bonf = FALSE,
  DIFvars = NULL,
  gap_prop = 0,
  extremes = TRUE,
  max_contrast = NULL,
  PSI = 0.8,
  ICs = FALSE,
  keep = FALSE,
  ignoreCores = 1,
  verbose = TRUE,
  ...,
  itemfit_param = NULL,
  estimation_param = NULL
)
```

Arguments

dset	a data.frame containing the data
modelType	a character value defining the rasch model to fit. Possible values: RM, PCM, RSM
combos	either 1) a list of item combinations to be tested, e.g. from apply_combo_rules or the passed_combos slot of an object of passed_exRa-class from a previous call to this function. Or 2) an object of passed_exRa-class. In this case, the previously fit models froms its passed_Models slot will also be used and will be passed to the test functions. This will speed up the analysis. If the parameter is NULL, all possible combinations of the items (columns) in dset will be tested
scale_length	a numeric vector defining the length of the item combinations to test
na.rm	a boolean value. If TRUE, in the respective item combination all cases with any NA are removed (na.omit). If FALSE, only cases with full NA responses are removed. NOTE: test_mloef currently does not allow for missing values. If test_mloef is under the tests to perform, na.rm will automatically be set TRUE for ALL tests.
tests	a vector of characters defining the tests to perform. Possible values: all_rawscores, test_itemfit, test_LR, test_mloef, test_waldtest, threshold_order, test_DIFtree,

	test_personsItems, test_respca, test_PSI. Tests will be performed in the given order. test_mloef is not available for pairwise estimation, threshold_order is not available (and not meaningful) for dichotomous models.
splitcr_mloef	Split criterion to define the item groups for test_mloef. "median" and "mean" split items in two groups based on their items' raw scores median or mean. "random" (only for 'psychotools' estimation) performs a random split (in this case, the seed can be set with the "splitseed" argument of itemfit_control. splitcr_mloef can also be a vector of length k (where k denotes the number of items) that takes two or more distinct values to define groups used for the Martin-Löf Test.
splitcr_LR	Split criterion for subject raw score splitting for test_LR. "median" uses the median as split criterion, "mean" performs a mean split, "random" (only for 'psychotools' or 'pairwise' estimation) performs a random split (in this case, the seed can be set with the "splitseed" argument of itemfit_control. splitcr_LR can also be a vector which assigns each person to a certain subgroup (typically an external criterion). This vector can be numeric, character or a factor.
splitcr_wald	Split criterion for subject raw score splitting for test_waldtest. "median" uses the median as split criterion, "mean" performs a mean-split, "random" (only for 'psychotools' or 'pairwise' estimation) performs a random split (in this case, the seed can be set with the "splitseed" argument of itemfit_control. Optionally splitcr_wald can also be a dichotomous vector which assigns each person to a certain subgroup (e.g., following an external criterion). This vector can be numeric, character or a factor.
icat_wald	a boolean value indicating if the waldtest will be conducted on item level (TRUE, default value) or on item category level. This parameter only effects estimations using 'psychotools' or 'pairwise' and will be ignored for eRm estimations.
alpha	a numeric value for the alpha level. Will be ignored for test_itemfit if use.pval in itemfit_control is FALSE
bonf	a boolean value whether to use a Bonferroni correction. Will be ignored if use.pval is FALSE
DIFvars	a data.frame containing the variables and their data to use for differential item functioning analysis with test_DIFtree
gap_prop	a numeric value between 0 and 1 that sets the criterion for the minimum proportion of neighboring person parameters with an item/threshold location in between. If set to 0, this criterion will not be checked (used in test_personsItems only)
extremes	a boolean value indicating if a check for the item/threshold locations left of the 2nd lowest and right of the 2nd highest person parameter (used in test_personsItems only).
max_contrast	a numeric value defining the maximum loading of a factor in the principal components analysis of the standardised residuals. Only relevant, if test_respca is one of the tests.
PSI	a numeric value defining the minimum value for the person- separation-index (separation reliablility).
ICs	a boolean value defining whether to compute information criteria for the remaining models. You can add these later to the object of class passed_exRa-class by using the add_ICs function.

keep	a boolean value difining whether des person parameters will be part of the [passed_exRa-class](#) results object (TRUE) or not (FALSE). Keeping the person parameters will result in shorter runtimes, if several tests that need these parameters are used. On the other hand there will be a largeramount of memeory usage.
ignoreCores	a numeric value for the number of cpu cores to hold out in parallelizing the test run.
verbose	a boolean value. If set to FALSE, all output during the analysis will be suppressed.
...	arguments for [itemfit_control](#) and [estimation_control](#)can be passed directly to this function.
itemfit_param	a list from [itemfit_control](#) with options for [test_itemfit](#)
estimation_param	
	options for parameter estimation using [estimation_control](#)

Value

an object of [passed_exRa-class](#).

Examples

```
library(exhaustiveRasch)
data(ADL)
passed <- exhaustive_tests(dset= ADL[c(1:4,7,12,14)],
  modelType= "RM", scale_length= 5, alpha=0.05,
  tests=c("test_LR", "test_itemfit", "test_respca"),
  splitcr_LR = ADL[,17], itemfit_param =
    itemfit_control(use.pval=FALSE, upperMSQ=1.5, lowerMSQ=0.5),
  estimation_param= estimation_control(
    est="psychotools"), verbose=FALSE)
```

InterprofessionalCollaboration

InterprofessionalCollaboration - polytomous example data

Description

data for certainty of action measured with the Health Professionals Competence Scales (HePCoS-G). Dimension: interprofessional collaboration. sample: N=716 nurses, midwifes, occupational therapists, physiotherapists and speech therapists.

Usage

InterprofessionalCollaboration

Format

V01-V19: "How confident do you feel in the following situation?" (0= not confident; 1= hardly confident; 2= rather confident; 3=very confident)

- V01: I communicate with other professions as part of my job.
- V02: I use information about a client from other professions.
- V03: I work with other professions when I transfer a client to their responsibility.
- V04: I work with other professions when I take over a client into my responsibility.
- V05: I involve specialists from other professions in the care of a client.
- V06: I coordinate goals of a client with the goals of other professions.
- V07: I coordinate health-promoting interventions for a client with other professions.
- V08: I inform other professions about the current status of a client.
- V09: I contribute aspects of a client's care to interprofessional case conferences.
- V10: I contribute aspects of a client's care to interprofessional case conferences and justify them on the basis of current research findings.
- V11: I contribute ethical aspects to interprofessional case conferences
- V12: I coordinate processes within an interprofessional team.
- V13: I coordinate communication processes during a conflict in an interprofessional team.
- V14: I lead an interprofessional team.
- V15: I participate in the development of interprofessional care concepts.
- V16: I participate in the development of an interdisciplinary evidence-based guideline.
- V17: I contribute my profession's perspective to discussions with members of other professions.
- V18: I contribute ethical aspects of care to a discussion with members of other professions.
- V19: I discuss the use of a new technology with members of other professions.
- profession: profession (1= physiotherapist; 2= occupational therapist; 3= speech therapist; 4= nurse; 5= midwife)
- age: age (1= <20; 2= 20-24; 3= 25-29; 4= 30-34; 5= 35-39; 6= 40-44; 7= 45-49; 8= 50-54; 9= 55-59; 10= >=60)
- sex: sex (1= male; 2= female)
- job_experience: job experience in years (including education)

Source

Data from the construction sample of the Health Professionals Competence Scales (HePCoS)

References

Grebe C, Schürmann M, Latteck, ÄD (2021). Die HePCoS-Skalen zur Kompetenzerfassung in den Gesundheitsfachberufen. Berichte aus Forschung und Lehre (48). Bielefeld, Fachhochschule Bielefeld. DOI: http://dx.doi.org/10.13140/RG.2.2.13480.08967/1

---

itemfit_control *options for test_itemfit()*

Description

options for test_itemfit()

Usage

```
itemfit_control(
  zstd = FALSE,
  msq = TRUE,
  outfits = TRUE,
  use.pval = TRUE,
  lowerMSQ = 0.7,
  upperMSQ = 1.3,
  lowerZ = -1.96,
  upperZ = 1.96,
  use.rel = FALSE
)
```

Arguments

zstd	a boolean value whether to check the standardised fit indices
msq	a boolean value whether to check the mean-squared fit indices
outfits	a boolean value whether to check outfit indices (if FALSE, only infits are checked)
use.pval	a boolean value whether to exclude combinations with at least one item with significant p-value
lowerMSQ	a numeric value for the lower bound for acceptable fit (mean-squared fit indices)
upperMSQ	a numeric value for the upper bound for acceptable fit (mean-squared fit indices)
lowerZ	a numeric value for the lower bound for acceptable fit (standardised fit indices)
upperZ	a numeric value for the upper bound for acceptable fit (standardised fit indices)
use.rel	a boolean value wheter to use the unweighted (default, FALSE) or weighted item fit indices for MSQ and z-standardised fit-indices. Only available for 'pairwise' and 'psychotools' estiomation, will be ignored, for 'eRm' estimation.

Value

a list containing the options

---

logLik.pers   *S3 logLik for Object of class "pers"*

Description

S3 logLik method to extract the log-likelihood for object of class pairwise::pers

Usage

```
## S3 method for class 'pers'
logLik(object, sat = FALSE, p = FALSE, ...)
```

Arguments

object	object of class pairwise::pers
sat	a "logical" with default set to sat=FALSE to return the Log-Likelihood of the data for the unrestricted modell based on parameters estimated with function pairwise::pers. If set to sat=TRUE the Log-Likelihood of the saturated model is returned instead.
p	a "logical" with default set to p=FALSE to return the category propabilities for the empirical data.
...	not used jet.

Value

an object of class 'logik', containing the likelihood an degrees of freedom

---

LRtest.psy   *itemfit statistics for 'psychotools' Anderson's likelihood ratio test for 'psychotools'*

Description

itemfit statistics for 'psychotools' Anderson's likelihood ratio test for 'psychotools'

Usage

```
LRtest.psy(model, modelType, splitcr = "median", splitseed = NULL)
```

Arguments

model	an object of 'psychotools' class 'raschmodel', 'pcmodel' or 'rsmodel' (a model previously fit using the 'psychotools' package) matching the value of model-Type.
modelType	a character value defining the type of Rasch model. Possible values: "RM", "PCM", "RSM"
splitcr	Split criterion for subject raw score splitting for test_LR. "median" uses the median as split criterion, "mean" performs a mean split, "random" performs a random split (in this case, the seed can be set with the "splitseed" argument. splitcr can also be a vector which assigns each person to a certain subgroup (typically an external criterion). This vector can be numeric, character or a factor.
splitseed	seed for random split

Value

the p-value of the likelihood-ratio test.

Examples

```
model <- psychotools::raschmodel(ADL[c(6,7,12,14,15)])
LRtest.psy(model=model, modelType="RM", splitcr="random", splitseed=332)
```

---

mloef.psy	*Martin-Loef test for psychotools*

Description

Martin-Loef test for psychotools

Usage

```
mloef.psy(model, modelType, splitcr = "median", splitseed = NULL)
```

Arguments

model	an object of 'psychotools' class 'raschmodel', 'pcmodel' or 'rsmodel' (a model previously fit using the 'psychotools' package) matching the value of model-Type.
modelType	a character value defining the type of Rasch model. Possible values: "RM", "PCM", "RSM"
splitcr	Split criterion to define the item groups. "median" and "mean" split items in two groups based on their items' raw scores median or mean. "random" performs a random split (in this case, the seed can be set with the "splitseed" argument. splitcr can also be a vector of length k (where k denotes the number of items) that takes two or more distinct values to define groups used for the Martin-Löf Test.
splitseed	seed for random split

Value

a list containing the test statistic, the degrees of freedom and the p-value of the Martin-Löf test.

Examples

```
model <- psychotools::raschmodel(ADL[c(6,7,12,14,15)])
mloef.psy(model=model, modelType="RM", splitcr="random", splitseed=332)
```

---

passed_exRa-class	*class passed_exRa, an S4 class representing an a result of the exhaustive_tests function*

Description

class passed_exRa, an S4 class representing an a result of the exhaustive_tests function

Slots

process a data.frame containing process information from the call to exhaustive_tests

passed_combos a list of vectors containing item combinations using the indices of the items

passed_models a list of objects of the class the respective package used for estimation uses for its models

passed_p.par a list of objects containing the person parameters. Depending on the package used for estimation, also residuals and/or the PSI value can be part of this list

IC a data.frame containing information criteria for each of the models in passed_models

data a data.frame containing the data used for the analyses.

timings a data.frame containing the the timings of the analyses.

---

ppar.psy	*itemfit statistics for psychotools*

Description

itemfit statistics for psychotools

Usage

```
ppar.psy(model = NULL)
```

Arguments

model   an object of 'psychotools' class 'raschmodel', 'pcmodel' or 'rsmodel' (a model previously fit using the 'psychotools' package) matching the value of model-Type.

Value

an object containing person parameters, residuals and PSI

Examples

```
model <- psychotools::raschmodel(ADL[c(6,7,12,14,15)])
ppar.psy(model)
```

---

remove_subsets	*removes subsets or supersets of item combinations*

Description

removes subsets or supersets of item combinations

Usage

```
remove_subsets(obj, keep_longest = FALSE)
```

Arguments

obj   either a list of vectors of item combinations (typically the passed_combos slot of an object of class passed_exRa or an object of [passed_exRa-class]. If combos is an object of [passed_exRa-class], all process data (the process slot) and for any removed item combination also the fit models in the passed_models slot will be removed.

keep_longest   boolean; if TRUE, the respective superset is kept (and all subsets of these supersets are removed), if FALSE all subsets is kept (and supersets of these subsets are removed).

Value

depending of the class of obj, either a list of numeric vectors containing the remaining item combinations or an object of [passed_exRa-class] with the remaining item combinations, fit models and information criteria, but without the process information.

Examples

```
library(exhaustiveRasch)
data(ADL)
passed_ADL <- exhaustive_tests(dset=ADL[1:15], scale_length=4:5,
  modelType= "RM", na.rm=TRUE, tests= c("test_LR"),
  splitcr_LR = ADL[,17], estimation_param = estimation_control())
passed_shortest <- remove_subsets(passed_ADL, keep_longest=FALSE)
```

```
summary,passed_exRa-method
```
summary function for class passed_exRa

Description

summary function for class passed_exRa

Usage

```
## S4 method for signature 'passed_exRa'
summary(object)
```

Arguments

object   an object of passed_exRa-class

Value

no object is returned, the summary is printed to the console. This comprises: tested scale lengths, total number of tested item combinations, applied tests, number of passed item combinations that passed each test, item importance and runtimes.

---

waldtest.psy   *Fischer and Scheiblechner's "wald-like" S-statistic for psychotools*

Description

Fischer and Scheiblechner's "wald-like" S-statistic for psychotools

Usage

```
waldtest.psy(
  model,
  modelType,
  splitcr = "median",
  splitseed = NULL,
  icat = FALSE
)
```

Arguments

model	an object of 'psychotools' class 'raschmodel', 'pcmodel' or 'rsmodel' (a model previously fit using the 'psychotools' package) matching the value of model-Type.
modelType	a character value defining the type of Rasch model. Possible values: "RM", "PCM", "RSM"
splitcr	split criterion for subject raw score splitting. "median" uses the median as split criterion, "mean" performs a mean-split, "random" performs a random split (in this case, the seed can be set with the "splitseed" argument. Optionally splitcr can also be a dichotomous vector which assigns each person to a certain subgroup (typically an external criterion). This vector can be numeric, character or a factor.
splitseed	seed for random split
icat	a boolean value defining wether to use item parameters ('psychotools' function 'itempar', if TRUE) or item category parameters ('psychotools' function 'threshpar')

Value

a vector containing the p-values of the Scheiblechner's "wald-like" S-statistic for the items (if icat=FALSE) or for the item categories (if icat=TRUE).

Examples

```
model <- psychotools::raschmodel(ADL[c(6,7,12,14,15)])
  waldtest.psy(model=model, modelType="RM", splitcr="random", splitseed=332,
  icat=FALSE)
```

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