

Package ‘IMak’

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Type Package

Title Item Maker

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Description This is an Automatic Item Generator for Psychological Assessment. Items created with the 'IMak' package should not be used in applied settings as part of the working protocol without ensuring first that the items meet the required psychometric quality standards (see Blum & Holling, 2018) <DOI:10.3389/fpsyg.2018.01286>.

Imports grDevices, graphics, utils

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build_fa	<i>Build figural analogies.</i>
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Description

build_fa generates the information of figural analogies that can be read by [plot_fa](#).

Usage

```
build_fa(isomorphs = 1, main.rot = c(0, 0), mirror = 0,
        trap.rot = c(0, 0), subtract = c(0, 0), dot.mov = c(0, 0),
        a.main = "R", a.flip = "R", a.trap = "R", a.dot = "R",
        constrict = F, al.main.rot = 0, al.mirror = 0, al.trap.rot = 0,
        al.subtract = 0, al.dot.mov = 0, correct = 0, add.rule = 0,
        automatic = T)
```

Arguments

isomorphs	A number of isomorphic items to be developed.
main.rot	A numeric vector with two main shape rotation values multiple of 45 and between -135 and 180. No rotation: 0.
mirror	A number designating the presence of shape reflection or no reflection (i.e., 1 or 0).
trap.rot	A numeric vector with two trapezium rotation values multiple of 45 and between -135 and 180. No rotation: 0.
subtract	A numeric vector with two line segments of the main shape to subtract from 1 to 5, or letter "R" for a random subtraction. No subtraction: 0.
dot.mov	A numeric vector with two dot edge movement amounts, with a maximum of 5 movements in total. No dot edge movement: 0.
a.main	A numeric vector with possible rotation states of the main shape of Figure A from 1 to 8. Random by default.
a.flip	A logical value designating whether Figure A is flipped with respect to its vertical axis or not (i.e., T or F). Random by default.
a.trap	A numeric vector with possible rotation states of the trapezium of Figure A from 1 to 8. Random by default.
a.dot	A numeric vector with possible dot positions in Figure A from 1 to 6. Random by default.
constrict	A character string designating a part of Figure A to display all possible positions every 'n' isomorphs.
al.main.rot	A numeric vector with alternative main shape rotation solutions. Random by default.
al.mirror	A numeric vector with alternative reflection solutions. Random by default.
al.trap.rot	A numeric vector with alternative trapezium rotation solutions. Random by default.
al.subtract	A numeric vector with alternative subtraction solutions. Random by default.
al.dot.mov	A numeric vector with alternative dot edge movement solutions. Random by default.
correct	A vector with numbers ranging from 1 to 9 for correct response placements. Random by default.
add.rule	A number specifying which rule from 1 to 5 adds itself to the options of one-rule-based items. Random by default.
automatic	Should options be generated by the program? True by default.

Details

The `isomorphs` parameter represents the number of isomorphic items to be created. Parameters `main.rot`, `mirror`, `trap.rot`, `subtract`, and `dot.mov` are the so-called radicals, and they can be therefore used to pass the radical arguments. Such arguments designate how rules are applied to all of the isomorphs. `main.rot` and `mirror` cannot be combined because of rule confusion (Blum & Holling, 2018). The `a.main.rot`, `a.flip`, `a.trap`, and `a.dot` parameters are the so-called incidentals. They affect how Figure A of the matrix presents itself in every isomorph. Setting `constrict` to "main", "trap" or "dot" displays all possible positions of a certain part of Figure A (i.e., main shape, trapezium or dot) every 'n' isomorphs. Radical parameters that use the prefix `al.` designate alternative solutions for each of the applied rules throughout the options by following a Solutions Combination Design (Blum & Holling, 2018). They are random by default when `automatic = T`. When `automatic = F`, arguments must be passed, which either designate rotation angles that distinguish the correct answer from the alternative solutions, or alternative reflection / subtraction / dot positions. Three things should be kept in mind: 1. Three alternative solutions should be chosen for the main rule when working with only one rule. If `add.rule` is not altered, then all of the other rules should also comprise one alternative solution each. If `add.rule` designates a specific rule from 1 to 5, then the latter statement is only valid for this rule. 2. Two alternative solutions should be chosen for each rule of two-rule-based items. 3. One alternative solution should be chosen for each rule of items comprising more than two rules.

Value

An object of class 'fa_items', basically a list including elements to be plotted with function [plot_fa](#).

Author(s)

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References

Blum, D., & Holling, H. (2018). Automatic generation of figural analogies with the IMak package. *Frontiers in psychology*, 9(1286), 1-13. DOI:10.3389/fpsyg.2018.01286

See Also

[plot_fa](#)

Examples

```
## Create two isomorphs with one rule, setting the correct answer to 1:
one <- build_fa(isomorphs = 2, dot.mov = c(1, 2), correct = 1)
## Plot them:
plot_fa(one)

## Create four isomorphs with two rules:
two <- build_fa(isomorphs = 4, main.rot = c(180, 135), trap.rot = c(90, 45))
## Plot them:
plot_fa(two)
```

```
## Create 20 isomorphs with three rules. Set automatic = F and affect the options:
three <- build_fa(isomorphs = 20, mirror = 1, trap.rot = c(90, 45), dot.mov = c(1, 2),
automatic = FALSE, al.mirror = c(0, 1), al.trap.rot = -45, al.dot.mov = 1)
## Plot them:
plot_fa(three)

## Create and plot four two-rule-based isomorphs, all of them comprising the same Figure A:
four <- build_fa(isomorphs = 4, a.main = 1, a.flip = FALSE, a.trap = 2, a.dot = 6,
mirror = 1, subtract = "R")
plot_fa(four)

## Create and plot 16 isomorphs by constricting the main shape rotation rule:
five <- build_fa(isomorphs = 16, subtract = c(1, 4), constrict = "main")
plot_fa(five)
```

plot_fa

Plot figural analogies.

Description

plot_fa plots figural analogies by reading the information previously stored in an object of class 'fa_items' generated with `build_fa`.

Usage

```
plot_fa(items, which = 0, mode = "A", language = "E",
language.dir = "A", form.int = "A", form.ext = "A",
size.shape = 1, size.dot = 2, size.line = 1, size.q = 3.5,
size.word = 1.2, info = T, sep = ",", directory = F,
switch.from = 0, switch.to = 0)
```

Arguments

items	An object of class 'fa_items' generated with function <code>build_fa</code> . No default.
which	A numeric vector designating which isomorph(s) to plot. Plot all by default.
mode	A character string designating plot mode "A", "B" or "C". Plot mode "A" by default.
language	A character string designating English ("E"), German ("D") or Spanish ("S") language. Default is "E".
language.dir	A character string designating language for output files. "A" by default selects all languages.
form.int	A character string designating the form from "A" to "D" of the internal main shape, or "R" for random. Default is "A".
form.ext	A character string designating the form from "A" to "D" of the trapezium, or "R" for random. Default is "A".
size.shape	A number designating the size of every shape. Default is 1.

size.dot	A number designating the size of every shape dot. Default is 2.
size.line	A number designating the thickness of every shape. Default is 1.
size.q	A number designating the size of the question mark. Default is 3.5.
size.word	A number designating the size of the verbal options. Default is 1.2.
info	Should the applied rules and correct answers be informed? True by default.
sep	Field separator character of the "Info.csv" file. The default ",", is recommended for English MS Office.
directory	A character string designating a folder in your PC where to store the isomorphs.
switch.from	Number 'p' designating an option from 1 to 8 to switch with 'q'.
switch.to	Number 'q' designating an option from 1 to 8 to switch with 'p'.

Details

The `plot_fa` function should not be assigned to an object, except when willing to use the optional parameters `switch.from` and `switch.to`. In the latter case, the object name should be the same as the name of the object of class 'fa_items', and the argument for which must designate the isomorph to be affected even if there is only one isomorph available. For example:

```
object <- plot_fa(object, which = 1,
  switch.from = 1, switch.to = 2)
```

Value

A data frame containing rules applied and right answers when `info = T` by default, or an object of class 'fa_items' when which has length 1, its value is greater than 0 and both `switch.from` and `switch.to` are greater than 0.

Author(s)

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References

Blum, D., & Holling, H. (2018). Automatic generation of figural analogies with the IMak package. *Frontiers in psychology*, 9(1286), 1-13. DOI:10.3389/fpsyg.2018.01286

See Also

[build_fa](#)

Examples

```
## Create two isomorphs with one rule, setting the correct answer to 1:
one <- build_fa(isomorphs = 2, dot.mov = c(1, 2), correct = 1)
## Plot them:
plot_fa(one)
## Change the correct answer of item 2 from position 1 to position 2:
one <- plot_fa(one, which = 2, switch.from = 1, switch.to = 2)
```

```
## Choose a directory and save the items:
# dir1 <- "enter your new directory here"
# plot_fa(one, directory = dir1)

## Create four isomorphs with two rules:
two <- build_fa(isomorphs = 4, mirror = 1, trap.rot = c(90, 45))
## Plot them in German language:
plot_fa(two, language = "D")
## Plot only items 2 and 3 in Spanish and choose form "B" for the internal main shape:
plot_fa(two, language = "S", form.int = "B", which = c(2, 3))
## Choose a different directory and save these two items by keeping the latter configuration:
# dir2 <- "enter your new directory here"
# plot_fa(two, which = c(2, 3), language.dir = "S", form.int = "B", directory = dir2)

## Create 20 isomorphs with three rules. Set automatic = F and affect the options:
three <- build_fa(isomorphs = 20, mirror = 1, trap.rot = c(90, 45), dot.mov = c(1, 2),
automatic = FALSE, al.mirror = c(0, 1), al.trap.rot = -45, al.dot.mov = 1)
## Plot them:
plot_fa(three)
## Plot each individual shape of item 13 in German language only:
plot_fa(three, which = 13, mode = "C", language = "D")
## Choose a different directory and save the item parts:
# dir3 <- "enter your new directory here"
# plot_fa(three, which = 13, mode = "C", language.dir = "D", directory = dir3)
```

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