Package 'PAutilities'

May 17, 2020

Type Package

Title Streamline Physical Activity Research

Version 1.0.1

Depends R (>= 2.10)

Description A collection of utilities that are useful for a broad range of tasks that are common in physical activity research, including the following: creation of Bland-Altman plots, formatted descriptive statistics, metabolic calculations (e.g. basal metabolic rate predictions) and conversions, demographic calculations (age and age-for-body-mass-index percentile), bout analysis of moderate-to-vigorous intensity physical activity, and analysis of bout detection algorithm performance.

License GPL-3

Encoding UTF-8

LazyData true

URL https://github.com/paulhibbing/PAutilities

BugReports https://github.com/paulhibbing/PAutilities/issues

RoxygenNote 6.1.1

Imports dplyr (>= 0.7), equivalence, ggplot2 (>= 2.2), graphics, lazyeval (>= 0.2), lubridate (>= 1.7.4), magrittr (>= 1.5), methods, matchingMarkets (>= 1.0.1), reshape2, rlang (>= 0.3.1), stats, Rcpp

Suggests testthat, knitr, rmarkdown

VignetteBuilder knitr

LinkingTo Rcpp

NeedsCompilation yes

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Repository CRAN

Date/Publication 2020-05-17 05:00:27 UTC

R topics documented:

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as *As("summaryTransition", "data.frame")*

Description

As("summaryTransition", "data.frame")

As("summaryTransition", "list")

ba_plot *Create a Bland-Altman plot*

Description

Create a Bland-Altman plot

Usage

```
ba_plot(plotdata, x_var, y_var, x_name, y_name, shape = 16, ...)
```

Arguments

plotdata	dataframe from which to build the plot
x_var	character expression to evaluate for the x-axis
y_var	character expression to evaluate for the y-axis
x_name	axis label for the x-axis
y_name	axis label for the y-axis
shape	numeric. The point shape to display.
...	further arguments passed to theme

Value

a Bland-Altman plot

References

Bland, J. M., & Altman, D. G. (1986). Statistical methods for assessing agreement between two methods of clinical measurement. lancet, 1(8476), 307-310.

Examples

```
data(ex_data, package = "PAutilities")

# Reduce the number of data points (for illustration purposes) by isolating
# the 150 largest cases

illustration_threshold <-
    quantile(ex_data$Axis1, probs = 1 - (150 / nrow(ex_data)))
ex_data <- ex_data[ex_data$Axis1 > illustration_threshold, ]

# Generate the plot
my_ba <- ba_plot(
    ex_data,
    "(Axis1 + Axis3) / 2",
    "Axis1 - Axis3",
    "mean(Axis1, Axis3)",
```

```
    "Axis1 - Axis3"
)

my_ba


# You can add to the plot as you would a normal ggplot object
    my_ba +
      ggplot2::geom_text(
      x = 2000, y = 9000, label = "A",
      size = 8, fontface = "bold", colour = "blue"
      )

# With caution, you can change some automatic options (e.g. color of
# regression line) by overwriting in a new layer

    my_ba + ggplot2::geom_smooth(method = "lm", se = FALSE, colour = "blue")
```

---

bout_mvpa *Classify moderate-to-vigorous physical activity in bouts of a specific minimum length*

Description

Classify moderate-to-vigorous physical activity in bouts of a specific minimum length

Usage

```
bout_mvpa(intensity, var_type = c("METs", "Intensity"), min_duration = 10,
  termination = 3, MoreArgs = list(breaks = c(-Inf, 1.51, 3, Inf), labels =
  c("SB", "LPA", "MVPA"), right = FALSE), ..., timestamps = NULL,
  output_var = c("is_MVPA", "bout_tracker"))
```

Arguments

intensity	a vector of intensity classifications to be re-classified according to the bout definition
var_type	character scalar indicating whether the intensity variable is a numeric vector of metabolic equivalents, or a factor variable giving activity intensity classification
min_duration	numeric scalar: minimum duration of a qualifying bout, in minutes
termination	numeric scalar: consecutive minutes of non-MVPA required to terminate the bout
MoreArgs	required arguments passed to cut
...	optional arguments passed to cut for converting METs to intensity classification

timestamps	optional vector of POSIX-formatted timestamps. Must have same length as intensity
output_var	the output variable(s) to give

Note

output_var gives one or both of is_MVPA and bout_tracker, the former being a vector of indicators (1 or 0) specifying whether a minute is part of a valid MVPA bout, and the latter being a collapsed data frame giving only the valid bouts of MVPA and the relevant information (i.e., duration of the bout, minutes of MVPA, and percentage of time spent in MVPA within the bout). If both are selected, they are returned in a list.

Examples

```
data(ex_data, package = "PAutilities")
ex_data$DateTime <- as.POSIXct(ex_data$DateTime, "UTC")


# Runs with a warning

bout_mvpa(ex_data$METs, "METs")

bout_mvpa(ex_data$METs, "METs", timestamps = ex_data$DateTime)


# Recommended usage
lapply(split(ex_data, strftime(ex_data$DateTime, "%Y-%m-%d", "UTC")),
function(x) {
bout_mvpa(x$METs, "METs", timestamps = x$DateTime)
})

lapply(split(ex_data, strftime(ex_data$DateTime, "%Y-%m-%d", "UTC")),
function(x) {
bout_mvpa(x$METs,
"METs",
timestamps = x$DateTime,
output_var = "is_MVPA")
})

lapply(split(ex_data, strftime(ex_data$DateTime, "%Y-%m-%d", "UTC")),
function(x) {
bout_mvpa(x$METs,
"METs",
timestamps = x$DateTime,
output_var = "bout_tracker")
})
```

descriptives *Compute descriptive statistics for a variable in the metabolic data set*

Description

Compute descriptive statistics for a variable in the metabolic data set

Usage

```
descriptives(dataset, variable, group = NULL)
```

Arguments

dataset	the dataset to analyze
variable	character scalar giving the variable name to summarize
group	character scalar giving an optional grouping variable for the summary

Examples

```
data(ex_data, package = "PAutilities")
ex_data$group_var <- rep(
 c("One", "Two", "Three"),
 each = ceiling(nrow(ex_data)/3)
)[seq(nrow(ex_data))]
descriptives(ex_data, "Axis1", "group_var")
```

ex_data *Example data for calculating bouts of moderate-to-vigorous physical activity*

Description

A dataset containing accelerometer data and predicted energy expenditure in metabolic equivalents (METs) that can be used to classify moderate-to-vigorous physical activity in continuous bouts.

Usage

```
ex_data
```

Format

A data frame with 10080 rows and 12 variables:

FileID character. Name of the file originating the data

Date character giving the date ("%m/%d/%Y")

Time character giving the time ("%H:%M:%S")

DateTime full timestamp (%Y-%m-%d %H:%M:%S) given as character

dayofyear numeric day of the year (i.e., julian date)

minofday numeric minute of the day (i.e., 0 for midnight and 1439 for 11:59)

Axis1 activity counts for the device's first axis

Axis2 activity counts for the device's second axis

Axis3 activity counts for the device's third axis

Steps number of steps taken

Vector.Magnitude vector magnitude (Euclidian norm) of the activity counts from the three axes

METs predicted energy expenditure, in metabolic equivalents

`get_age` *Calculate age*

Description

Takes two Date objects and calculates age based on `difftime` (in days) divided by 365.2425 days per year (for age in years) or 30.4375 days per month (for age in months).

Usage

```
get_age(birthdate, current_date, units = c("years", "months"))
```

Arguments

`birthdate`	Date object giving the date of birth
`current_date`	Date object giving the date from which age is to be calculated
`units`	The units in which age should be reported

Value

Numeric value giving age in the specified units.

Examples

```
get_age(as.Date("2000-01-01"), Sys.Date(), "years")
```

`get_BMI_percentile` *Calculate youth BMI percentile from CDC standards*

Description

Calculate youth BMI percentile from CDC standards

Usage

```
get_BMI_percentile(weight_kg, height_cm, age_yrs, age_mos = NULL,
  sex = c("M", "F"), output = c("percentile", "classification", "both"))
```

Arguments

`weight_kg`	Weight in kilograms
`height_cm`	height in centimeters
`age_yrs`	age in years
`age_mos`	age in months (optional)
`sex`	Character scalar indicating participant's sex
`output`	What should be returned: raw percentile, weight status classification, or both?

Details

If `age_mos` is *not* provided, it will be calculated based on `age_yrs`, assuming 365.2425 days per year and 30.4375 days per month. Depending on how the initial age calculation was made, rounding error will occur. Thus, use of the `get_age` function is recommended. If `age_mos` *is* provided, `age_yrs` can be passed as `NULL`.

Value

One of: A numeric scalar giving the BMI percentile (for `output = "percentile"`); a factor scalar giving the weight status (for `output = "classification"`); or a list with the percentile and classification (for `output = "both"`).

References

This function was developed with reference to public domain resources provided by the Centers for Disease Control and Prevention. For more information, see:

https://www.cdc.gov/obesity/childhood/defining.html

https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/tool_for_schools.html

Examples

```
get_BMI_percentile(39.4, 144.5, 12.35, sex = "M")
```

get_bmr *Retrieve estimated basal metabolic rate for an individual*

Description

Retrieve estimated basal metabolic rate for an individual

Usage

```
get_bmr(Sex = c("M", "F"), Ht = NULL, Wt, Age, verbose = FALSE,
  RER = NULL, equation = c("ht_wt", "wt", "both"), kcal_table = c("Lusk",
  "Peronnet", "both"), method = c("Schofield", "FAO", "both"),
  MJ_conversion = c("thermochemical", "dry", "convenience", "all"),
  kcal_conversion = 5)
```

Arguments

Sex	The individual's sex
Ht	The individual's height, in meters
Wt	The individual's weight, in kilograms
Age	The individual's age, in years
verbose	Logical. Should processing updates be printed?
RER	numeric. The respiratory exchange ratio
equation	The equation to apply
kcal_table	The table to reference for converting kilocalories to oxygen consumption. See get_kcal_vo2_conversion
method	The calculation method to use
MJ_conversion	The value to use for converting megajoules to kilocalories. Defaults to thermochemical.
kcal_conversion	numeric. If RER is NULL (default), the factor to use for converting kilocalories to oxygen consumption

References

Schofield, W. N. (1985). Predicting basal metabolic rate, new standards and review of previous work. *Human nutrition. Clinical nutrition*, 39, 5-41.

Examples

```
# Get BMR for an imaginary 900-year-old person (Age is only
# used to determine which equations to use, in this case the
# equations for someone older than 60)
```

```
get_bmr(
  Sex = "M", Ht = 1.5, Wt = 80, Age = 900, equation = "both",
  method = "both", RER = 0.865, kcal_table = "both",
  MJ_conversion = c("all")
)

get_bmr(
  Sex = "M", Ht = 1.5, Wt = 80, Age = 900, MJ_conversion = "all",
  kcal_conversion = 4.86
)

get_bmr(
  Sex = "M", Ht = 1.5, Wt = 80, Age = 900, method = "FAO",
  kcal_conversion = 4.86
)
```

`get_indices` *Retrieve indices for a rolling window analysis*

Description

Retrieve indices for a rolling window analysis

Usage

```
get_indices(y_var, window_size = 15L)
```

Arguments

`y_var`	NumericVector. Input on which to define the indices for each roll of the window
`window_size`	int. The size of the window

Value

a list in which each element contains `window_size` consecutive integers that indicate which elements of `y_var` would be extracted for that roll of the window

Note

For this function, the output elements contain positions (i.e., indices) from `y_var`, whereas for `rolling_groups` the output elements contain the raw values found at each index

See Also

`rolling_groups`

Examples

```
result <- get_indices(1:100, 10)
head(result)
tail(result)
```

`get_intensity` *Classify activity intensity*

Description

Supports intensity classification via energy expenditure with or without additional posture requirements (i.e., for sedentary behavior to be in lying/seated posture)

Usage

```
get_intensity(mets, posture = NULL, ...)
```

Arguments

`mets`	numeric vector of metabolic equivalents to classify
`posture`	character vector of postures
`...`	further arguments passed to `cut`

Details

If `breaks` and `labels` arguments are not provided, default values are <= 1.5 METs for sedentary behavior, 1.51-2.99 METs for light physical activity, and >= 3.0 METs for moderate-to-vigorous physical activity.

It is expected for the elements of `posture` to be one of `c("lie","sit","stand","other")`. The function will run (with a warning) if that requirement is not met, but the output will likely be incorrect.

Value

a factor giving intensity classifications for each element of `mets`

Examples

```
mets <- seq(1, 8, 0.2)
posture <- rep(
c("lie", "sit", "stand", "other"), 9
)

intensity_no_posture <- get_intensity(mets)
intensity_posture <- get_intensity(mets, posture)
head(intensity_no_posture)
head(intensity_posture)
```

get_kcal_vo2_conversion *Retrieve conversion factors from kilocalories to oxygen consumption*

Description

Retrieve conversion factors from kilocalories to oxygen consumption

Usage

```
get_kcal_vo2_conversion(RER, kcal_table = c("Lusk", "Peronnet", "both"))
```

Arguments

RER	numeric. The respiratory exchange ratio
kcal_table	The table to reference for converting kilocalories to oxygen consumption. See get_kcal_vo2_conversion

Details

RER values are matched to the table entries based on the minimum absolute difference. If there is a tie, the lower RER is taken.

Value

numeric vector giving the conversion factor from the specified table(s)

References

Peronnet, F., & Massicotte, D. (1991). Table of nonprotein respiratory quotient: an update. *Can J Sport Sci*, 16(1), 23-29.

Lusk, G. (1924). Analysis of the oxidation of mixtures of carbohydrate and fat: a correction. *Journal of Biological Chemistry*, 59, 41-42.

Examples

```
get_kcal_vo2_conversion(0.85, "both")
```

index_runs *Run length encoding with indices*

Description

Run length encoding with indices

Usage

```
index_runs(x, zero_index = FALSE)
```

Arguments

x	vector of values on which to perform run length encoding
zero_index	logical. Should indices be indexed from zero (useful for Rcpp)?

Value

A data frame with information about the runs and start/stop indices

Examples

```
x <- c(
  FALSE, TRUE, FALSE, FALSE, FALSE, TRUE,
  FALSE, TRUE, TRUE, FALSE, TRUE, FALSE,
  FALSE, FALSE, FALSE, FALSE, TRUE, TRUE,
  FALSE, TRUE
)
head(index_runs(x))
```

manage_procedure *Printing and timing utility for managing processes*

Description

Printing and timing utility for managing processes

Usage

```
manage_procedure(part = c("Start", "End"), ..., timer = NULL,
  verbose = TRUE)

get_duration(timer)
```

Arguments

part	character scalar, either Start or End.
...	character strings to print. Default messages will print if no arguments are provided.
timer	a proc_time object. Required for manage_procedure only if using the default message for part = "End" default message.
verbose	logical. Print to console?

Value

For part = "Start", a proc_time object (i.e., a timer passable to an eventual part = "End" command); for part = "End", invisible

Examples

```
manage_procedure("Start", "String will be printed\n")
timer <- manage_procedure(
"Start", "Printing a string is optional", verbose = FALSE
)

## Default starting message
manage_procedure("Start")

## Default ending message
manage_procedure("End", timer = timer)

## Other examples
get_duration(timer)
manage_procedure("End", "Custom ending message")
```

---

mean_sd *Compute the mean and standard deviation of a vector, returning a formatted string containing the values as 'M +/- SD'*

Description

Compute the mean and standard deviation of a vector, returning a formatted string containing the values as 'M +/- SD'

Usage

```
mean_sd(x = NULL, MoreArgs = NULL, give_df = TRUE, ..., mean_x = NULL,
  sd_x = NULL)
```

Arguments

x	numeric vector of values to summarize
MoreArgs	named list of arguments to pass to mean and sd
give_df	logical. Should mean, sd, and summary string be returned in a data frame?
...	additional arguments passed to format
mean_x	an already-calculated mean value for x
sd_x	an already-calculated sd value for x

Examples

```
mean_sd(rnorm(1:100, 50))
```

---

paired_equivalence_test.data.frame

Perform equivalence testing on paired samples

Description

Perform equivalence testing on paired samples

Usage

```
## S3 method for class 'data.frame'
paired_equivalence_test(x, y, y_type = c("both",
  "criterion", "comparison"), alpha = 0.05, na.rm = TRUE,
  scale = c("relative", "absolute"), absolute_region_width = NULL,
  relative_region_width = NULL, ...)

## Default S3 method:
paired_equivalence_test(x, y, y_type = c("both",
  "criterion", "comparison"), alpha = 0.05, na.rm = TRUE,
  scale = c("relative", "absolute"), absolute_region_width = NULL,
  relative_region_width = NULL, ...)

paired_equivalence_test(x, y, y_type = c("both", "criterion", "comparison"),
  alpha = 0.05, na.rm = TRUE, scale = c("relative", "absolute"),
  absolute_region_width = NULL, relative_region_width = NULL, ...)
```

Arguments

x	numeric vector representing the (possibly surrogate) sample
y	numeric vector representing the (possibly criterion) sample. Index paired with x
y_type	classification of y for the purpose of analysis. Can be "criterion", "comparison", or "both".

alpha	the alpha level for the test
na.rm	logical. Omit mean values for mean calculations?
scale	character specifying whether the test should occur on an absolute or relative scale
absolute_region_width	the region width for use when scale = "absolute"
relative_region_width	the region width for use when scale = "relative"
...	further arguments passed to methods. Currently unused.

Value

a 'paired_equivalence' object summarizing the test input and results

Note

If a value is not specified for the region width that corresponds with scale, a default value will be assigned with a warning.

References

Dixon et al.

Examples

```
set.seed(1544)
x <- data.frame(
  var1 = rnorm(500, 15, 4),
  var2 = rnorm(500, 23, 7.3)
)
y <- rnorm(500, 17.4, 9)

test_result <- paired_equivalence_test(
  x, y, relative_region_width = 0.25
)

lapply(test_result, head)
```

PAutilities *PAutilities: Streamline Physical Activity Research*

Description

A collection of utilities that are useful for a broad range of tasks that are common in physical activity research. The main features (with associated functions in parentheses) are:

Details

* Bland-Altman plots (ba_plot) * Bout analysis for moderate-to-vigorous physical activity (bout_mvpa) * Formatted descriptive statistics descriptives * Demographic calculations (get_age and get_BMI_percentile) * Metabolic calculations (get_bmr, weir_equation, and get_kcal_vo2_conversion) * Analysis of bout detection algorithm performance (get_transition_info and associated methods, e.g. summary and plot)

---

plot.paired_equivalence

Plot the outcome of a paired equivalence test

Description

Plot the outcome of a paired equivalence test

Usage

```
## S3 method for class 'paired_equivalence'
plot(x, shade = "auto", ...)

shaded_equivalence_plot(results, ...)

unshaded_equivalence_plot(results, ...)
```

Arguments

x	the object to be plotted
shade	logical. Should the results be plotted using a shaded equivalence region?
...	arguments passed to ggplot2::theme.
results	data frame. The results component of a paired_equivalence object

Details

shaded_equivalence_plot plots the results of an equivalence test in which a single equivalence region applies to all variables. In that case, the equivalence region is displayed as a shaded region. unshaded_equivalence_plot plots the results of an equivalence test in which variables have unique equivalence regions. In that case, the equivalence regions are displayed as dodged "confidence intervals".

Value

A plot of the equivalence test

Examples

```
set.seed(1544)
y <- rnorm(500, 17.4, 9)
z <- data.frame(
  var1 = rnorm(500, 15, 4),
  var2 = rnorm(500, 23, 7.3)
)

# Optionally create artificial missing values to trigger unshaded plot
missing_indices <- sample(seq(nrow(z)), 250)
z$var1[missing_indices] <- NA

x <- paired_equivalence_test(
  z, y, "criterion", scale = "relative",
  relative_region_width = 0.25
)

plot(x)
```

---

plot.spurious_curve *Plot a spurious curve*

Description

Plot a spurious curve

Usage

```
## S3 method for class 'spurious_curve'
plot(x, ...)
```

Arguments

x	a spurious_curve object
...	further arguments (currently unused)

Value

a plot of the object

See Also

spurious_curve

Examples

```
set.seed(100)
predictions <- (sample(1:100)%%2)
references  <- (sample(1:100)%%2)

trans <- get_transition_info(
  predictions, references, 7
)
result <- spurious_curve(trans)
plot(result)
```

`plot.transition` *Plot the transitions and matchings from a* `transition` *object*

Description

Plot the transitions and matchings from a `transition` object

Usage

```
## S3 method for class 'transition'
plot(x, ...)
```

Arguments

`x`	the object to plot
`...`	further methods passed to or from methods, currently unused

Value

A plot of the predicted and actual transitions in a `transition` object, as well as the matchings between them

Examples

```
predictions <- (sample(1:100)%%2)
references  <- (sample(1:100)%%2)
window_size <- 7
transitions <- get_transition_info(predictions, references, window_size)
plot(transitions)
```

`rmr_sliding` *Calculate resting metabolic rate using a sliding window method*

Description

Calculate resting metabolic rate using a sliding window method

Usage

```
rmr_sliding(vo2_values, vo2_timestamps, start_time, stop_time,
  window_size_minutes = 5)
```

Arguments

`vo2_values`	numeric vector of oxygen consumption values
`vo2_timestamps`	timestamps corresponding to each element of `vo2_values`
`start_time`	the beginning time of the assessment period
`stop_time`	the ending time of the assessment period
`window_size_minutes`	the size of the sliding window, in minutes

Value

A data frame giving the oxygen consumption from the lowest window, as well as the time difference from first to last breath in the same window.

Examples

```
set.seed(144)
fake_start_time <- Sys.time()
fake_stop_time <- fake_start_time + 1800
fake_timestamps <- fake_start_time + cumsum(sample(1:3, 500, TRUE))
fake_timestamps <- fake_timestamps[fake_timestamps <= fake_stop_time]
fake_breaths <- rnorm(length(fake_timestamps), 450, 0.5)
window_size <- 5

rmr_sliding(
  fake_breaths, fake_timestamps,
  fake_start_time, fake_stop_time,
  window_size
)
```

rolling_groups *Loop along a vector, returning n elements at a time in a list*

Description

Loop along a vector, returning n elements at a time in a list

Usage

```
rolling_groups(values, n = 2L)
```

Arguments

values	IntegerVector. The vector to loop along
n	int. The number of elements to return in each element of the resulting list

Value

a list in which each element contains n elements from values

Note

For this function, the output elements contain raw values from values, whereas for get_indices the output elements contain the positions (i.e., indices) rather than the raw values

See Also

get_indices

Examples

```
groups <- rolling_groups(0:50, 3)
head(groups)
tail(groups)
```

spurious_curve *Perform a spurious curve analysis*

Description

Assess performance using the Transition Pairing Method when the spurious pairing threshold is varied

Usage

```
spurious_curve(trans, predictions, references, thresholds = 1:20)
```

Arguments

trans	a transition object
predictions	vector of predictions indicating transition (1) or non-transition (2)
references	vector of criteria indicating transition (1) or non-transition (2)
thresholds	the threshold settings to test

Value

an object with class spurious_curve

Examples

```
set.seed(100)
predictions <- (sample(1:100)%%2)
references  <- (sample(1:100)%%2)

trans <- get_transition_info(
  predictions, references, 7
)
head(spurious_curve(trans))
```

---

summaryTransition-class

An S4 class containing summary information about a transition *object*

Description

An S4 class containing summary information about a transition object

Slots

result a data frame with the summary information

test_errors *Compare numeric variables in a data frame based on root-squared differences*

Description

Compare numeric variables in a data frame based on root-squared differences

Usage

```
test_errors(reference, target, vars, tolerance = 0.001005,
  return_logical = TRUE)
```

Arguments

reference	a data frame giving reference data
target	a data frame giving target data
vars	character vector of variable names to compare in each data frame
tolerance	allowable difference between numeric values
return_logical	logical. Should result be given as a logical vector (indicating TRUE/FALSE equality within tolerance) or a data frame of error summary values?

Value

If return_logical = TRUE, a named logical vector with one element per variable compared, indicating whether the maximum and root-mean-squared differences fall within the tolerance. If return_logical = FALSE, a data frame indicating the variables compared and the maximum and root-mean-squared differences.

Note

It is assumed that reference and target have equal numbers of rows.

Examples

```
reference <- data.frame(
a = 1:100, b = 75:174
)

target <- data.frame(
  a = 0.001 + (1:100),
  b = 76:175
)

test_errors(reference, target, c("a", "b"))
test_errors(reference, target, c("a", "b"), return_logical = FALSE)
```

weight_status *Determine weight status from body mass index*

Description

Allows users to determine weight status from body mass index (BMI). The function is designed to classify adult weight status, with default settings yielding weight classes defined by the Centers for Disease Control and Prevention (see reference below). Alternatively, the function can be used as a wrapper for `get_BMI_percentile` to obtain classifications for youth.

Usage

```
weight_status(bmi = NULL, breaks = c(-Inf, 18.5, 25, 30, 35, 40, Inf),
  labels = c("Underweight", "Normal Weight", "Overweight",
  "Obese_1", "Obese_2", "Obese_3"), right = FALSE, youth = FALSE, ...)

#get_BMI_percentile(weight_kg, height_cm, age_yrs, age_mos = NULL,
  #sex = c("M", "F"), output = c("percentile", "classification", "both"))
```

Arguments

`bmi`	numeric scalar. The participant BMI.
`breaks`	numeric vector. The boundaries for each weight class; passed to `base::cut`, with warnings if `-Inf` and `Inf` are not included in the vector.
`labels`	character vector. The labels for each weight class; passed to `base::cut`, and should have a length one less than the length of `breaks`
`right`	logical. See `?base::cut`
`youth`	logical. Use function as a wrapper for `get_BMI_percentile`?
`...`	Arguments passed to `get_BMI_percentile`

Value

a factor scalar reflecting weight status

References

https://www.cdc.gov/obesity/adult/defining.html

Examples

```
status <- sapply(17:42, weight_status)
head(status)
```

`weir_equation` *Calculate energy expenditure using the Weir equation*

Description

Calculate energy expenditure using the Weir equation

Usage

```
weir_equation(VO2, VCO2, epochSecs)
```

Arguments

`VO2`	Oxygen consumption
`VCO2`	Carbon dioxide production
`epochSecs`	The averaging window of the metabolic data, in seconds

Examples

```
weir_equation(3.5, 3.1, 60)
```

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