Package 'matuR'

October 13, 2022

Title Athlete Maturation and Biobanding

Version 0.0.1.0

Description Identifying maturation stages across young athletes is paramount for talent identification. Furthermore, the concept of biobanding, or grouping of athletes based on their biological development, instead of their chronological age, has been widely researched. The goal of this package is to help professionals working in the field of strength & conditioning and talent ID obtain common maturation metrics and as well as to quickly visualize this information via several plotting options. For the methods behind the computed maturation metrics implemented in this package refer to Khamis, H. J., & Roche, A. F. (1994) <https://pubmed.ncbi.nlm.nih.gov/7936860/>, Mirwald, R.L et al., (2002) <https://pubmed.ncbi.nlm.nih.gov/11932580/> and Cumming, Sean P. et al., (2017) <doi:10.1519/SSC.0000000000000281>.

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LazyData true

Imports dplyr, ggplot2, lubridate, tidyr, magrittr, ggrepel

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Depends R (>= 2.10)

URL https://github.com/josedv82/matuR

BugReports https://github.com/josedv82/matuR/issues

NeedsCompilation no

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Repository CRAN

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R topics documented:

`curves` *Data from growth charts*

Description

Data from growth charts

Usage

```
curves
```

Format

Data frame with 14 variables and 436 observations:

Gender A character string. Refers to Male or Female.

Agemos Age in months

Power Power in the Box-Cox transformation

Median Median

CV Generalized Coeficient of Variation

P3 Data under percentile 3

P5 Data under percentile 5

P10 Data under percentile 10

P25 Data under percentile 25

P50 Data under percentile 50

P75 Data under percentile 75

P90 Data under percentile 90

P95 Data under percentile 95

P97 Data under percentile 97

Details

A data frame containing information for growth charts from the National Center from Health and Statistics. Visit https://www.cdc.gov/growthcharts/percentile_data_files.htm for more details.

`data_sample` *A sample dataset for demostration purposes.*

Description

A sample dataset for demostration purposes.

Usage

```
data_sample
```

Format

Data frame with 13 variables and 20 observations:

Athlete A character string. Name of the subjects.

`Date of Birth` A date object referring to the DOB for each athlete.

`Testing Date` A date object referring to the date of testing of each athlete.

Gender A character string. Refers to Male or Female.

`Weight1 (KG)` A number. Weight in kgs. Measurement 1.

`Weight2 (KG)` A number. Weight in kgs. Measurement 2.

`Height1 (CM)` A number. Height in cms. Measurement 1.

`Height2 (CM)` A number. Height in cms. Measurement 2.

`Sitting Height1 (CM)` A number. Length of the trunk in cms for a seated measurement. Measurement 1.

`Sitting Height2 (CM)` A number. Length of the trunk in cms for a seated measurement. Measurement 2.

`Bench Height2 (CM)` A number. If the sitting height is done using a chair or a bench, indicate its length, otherwise use 0.

`Mothers Height (CM)` A number. The standing height of the athlete's mother in cms.

`Fathers Height (CM)` A number. The standing height of the athlete's father in cms.

Details

A data frame containing unreal sample data for demostration purposes only. It also serves as an example for a template of how user collected data should look. Use this dataset to learn about the functions on this package.

maturation_cm *Maturation and Biobanding Metrics*

Description

This function returns a dataframe wih computed maturation metrics in cms calculated from the raw data imported by the user. See references for further details about the methodology behind each metric. For the same table in Inches see `maturation_in()`

Usage

```
maturation_cm(data)
```

Arguments

`data`	A data frame. See data_sample for formatting reference.

Value

A data frame with the following columns:

Athlete A chracter string. The name of the athlete

Gender A character String. The gender of the athlete

`Testing Date` A date. The data collection date for each athlete

`Birth Year` The year of birth for every athlete

Quarter The yearly quarter in which athletes were born

`Height (CM)` The height in cms for each athlete at the time of testing

`Estimated Adult Height (CM)` The estimated adult height in cms of the athlete using the Khamis-Roche method. See references for further details.

`% Adult Height` Their current height expressed as %, compared to their predicted adult height

`Remaining Growth (CM)` The difference between their predicted adult height and current height, in cms

`Maturity Offset (years)` Difference between their current age and their estimated age at PHV, espressed in years.

`Age @ PHV` The estimated age of the player at the time of Peak Height Velocity. Calculated using the Mirwald equation. See references for further details.

`Maturity Category` Categries for bio-banding based on the work from Cumming et al, 2017. See references for further details.

References

- Khamis, H. J., & Roche, A. F, 1994. Predicting adult height without using skeletal age: The Khamis-Roch
- Sean P. Cumming, Rhodri S. Lloyd, John L. Oliver, Joey C. Eisenmann & Robert M. Malina, 2017. Bio-bandi
- Mirwald, R.L., Baxter-Jones, A.D.G., Bailey, D.A., & Beunen, G.P., 2002. An assessment of maturity fro
- Johnson DM, Williams S, Bradley B, Sayer S, Fisher JM. Growing pains : Maturity associated variation in

Examples

```
maturation_cm(data_sample)
```

`maturation_in` *Maturation and Biobanding Metrics*

Description

This function returns a dataframe wih computed maturation metrics in inches calculated from the raw data imported by the user. See references for further details about the methodology behind each metric. For the same table in centimeters use `maturation_cm()`

Usage

```
maturation_in(data)
```

Arguments

`data`	A data frame. See data_sample for formatting reference.

Value

A data frame with the following columns:

Athlete A chracter string. The name of the athlete

Gender A character String. The gender of the athlete

`Testing Date` A date. The data collection date for each athlete

`Birth Year` The year of birth for every athlete

Quarter The yearly quarter in which athletes were born

`Height (IN)` The height in inches for each athlete at the time of testing

`Estimated Adult Height (IN)` The estimated adult height in inches of the athlete using the Khamis-Roche method. See references for further details.

`% Adult Height` Their current height expressed as %, compared to their predicted adult height

`Remaining Growth (IN)` The difference between their predicted adult height and current height, in inches

`Maturity Offset (years)` Difference between their current age and their estimated age at PHV, espressed in years.

`Age @ PHV` The estimated age of the player at the time of Peak Height Velocity. Calculated using the Mirwald equation. See references for further details.

`Maturity Category` Categries for bio-banding based on the work from Cumming et al, 2017. See references for further details.

References

- Khamis, H. J., & Roche, A. F, 1994. Predicting adult height without using skeletal age: The Khamis-Roch
- Sean P. Cumming, Rhodri S. Lloyd, John L. Oliver, Joey C. Eisenmann & Robert M. Malina, 2017. Bio-bandi
- Mirwald, R.L., Baxter-Jones, A.D.G., Bailey, D.A., & Beunen, G.P., 2002. An assessment of maturity fro
- Johnson DM, Williams S, Bradley B, Sayer S, Fisher JM. Growing pains : Maturity associated variation in

Examples

```
maturation_cm(data_sample)
```

---

plot_growth_female *Height (current + predicted) vs growth curves plot for females.*

Description

This function returns a ggplot object showing the **current** and **predicted height** vs normal growth charts for american population.

Usage

```
plot_growth_female(data, athlete)
```

Arguments

data	A data frame. The object containing the raw data we wish to analize.
athlete	A character string with the name of the athlete we wish to plot.

Details

Data for growth charts was obtained from the National Center for Health Statistics.

Please visit https://www.cdc.gov/growthcharts/percentile_data_files.htm to learn more about this information.

Be aware, players from different populations to the one used on these growth charts may not be well represented.

For males, use documentation for `plot_growth_male()`

Value

A plot (ggplot)

Examples

```
plot_growth_female(data_sample, "Athlete 18")
```

`plot_growth_male` *Height (current + predicted) vs growth curves plot for males.*

Description

This function returns a ggplot object showing the **current** and **predicted height** vs normal growth charts for american population.

Usage

```
plot_growth_male(data, athlete)
```

Arguments

`data`	A data frame. The object containing the raw data we wish to analize.
`athlete`	A character string with the name of the athlete we wish to plot.

Details

Data for growth charts was obtained from the National Center for Health Statistics.

Please visit https://www.cdc.gov/growthcharts/percentile_data_files.htm to learn more about this information.

Be aware, players from different populations to the one used on these growth charts may not be well represented.

For females, use documentation for `plot_growth_female()`

Value

A plot (`ggplot`)

Examples

```
plot_growth_male(data_sample, "Athlete 08")
```

plot_maturity_offset *Maturity Offset Plot*

Description

This function returns a lollipop ggplot object showing the offset in years from current age to estimated age at PHV for each athlete in the dataset.

Usage

```
plot_maturity_offset(data)
```

Arguments

data	A data frame. The object containing the raw data we wish to analize.

Details

Refer to references cited on this package for further details on how these metrics are calculated.

Value

A lolliplot plot (ggplot)

Examples

```
plot_maturity_offset(data_sample)
```

plot_predicted_height_cm *Predicted Height Plot (cms)*

Description

This function returns a ggplot object showing the predicted adult height for each athlete in the dataset. For the same plot in inches use plot_predicted_height_in()

Usage

```
plot_predicted_height_cm(data)
```

Arguments

data	A data frame. The object containing the raw data we wish to analize.

Value

A plot (ggplot)

Examples

```
plot_predicted_height_cm(data_sample)
```

---

plot_predicted_height_in *Predicted Height Plot (Inches)*

Description

This function returns a ggplot object showing the predicted adult height in inches for each athlete in the dataset. For the same plot in centimeters use `plot_predicted_height_cm()`

Usage

```
plot_predicted_height_in(data)
```

Arguments

data	A data frame. The object containing the raw data we wish to analize.

Value

A plot (ggplot)

Examples

```
plot_predicted_height_in(data_sample)
```

---

plot_puberty_stages *% Adult Height vs Maturity Offset in Years*

Description

This function returns a scatterplot showing the % of adult height vs the maturity offset (in years).

Usage

```
plot_puberty_stages(data)
```

Arguments

data	A data frame. The object containing the raw data we wish to analize.

Value

A plot (ggplot)

Examples

```
plot_puberty_stages(data_sample)
```

---

plot_time_phv *Time to PHV Dumbell Plot*

Description

This function returns a dumbell plot showing the difference (in years) between current age and estimated age at PHV for each athlete in the dataset.

Usage

```
plot_time_phv(data)
```

Arguments

data	A data frame. The object containing the raw data we wish to analize.

Details

Athletes are ordered by the difference between current and estimated age at PHV, as shown on the right of the plot, from highest to lowest.

Check the references cited on this package for further details on how these metrics are calculated.

Value

A dumbell plot (ggplot)

Examples

```
plot_time_phv(data_sample)
```

`table` *Khamis-Roche model estimates tables*

Description

Khamis-Roche model estimates tables

Usage

```
table
```

Format

Data frame with 13 variables and 20 observations:

Age Age group in years. Rounded every 6 months.

B1 Model intercept for males.

M-Height Height (inches), for males.

M-Weight Weight (lbs) for males.

`M-Midparent Stature` Average estature across mather & father for each age group, for males.

B2 Model intercept for females.

F-Height Height (inches), for females.

F-Weight Weight (lbs) for males.

`F-Midparent Stature` Average estature across mather & father for each age group, for females.

Details

A data frame containing model estimates and predictions by age from the Khamis-Roche method.

For further details visit https://pediatrics.aappublications.org/content/94/4/504.short

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