

Package ‘kronos’

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Title Microbiome Oriented Circadian Rhythm Analysis Toolkit

Version 1.0.0

URL <https://github.com/thomazbastiaanssen/kronos>

Description The goal of 'kronos' is to provide an easy-to-use framework to analyse circadian or otherwise rhythmic data using the familiar R linear modelling syntax, while taking care of the trigonometry under the hood.

Depends R (>= 3.5.0)

Imports stats, methods, ggplot2

License GPL (>= 3)

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Author Thomaz Bastiaanssen [aut, cre],
Sarah-Jane Leigh [aut]

Maintainer Thomaz Bastiaanssen <thomazbastiaanssen@gmail.com>

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bigdata	<i>Snippet of example data to demonstrate the functionality of 'kronos' between and among three different groups</i>
---------	--

Description

Snippet of example data to demonstrate the functionality of 'kronos' between and among three different groups

Usage

bigdata

Format

A long format data.frame object with three 113 columns, features, and 94 rows, samples.

Source

Dummy data modified from untargeted hippocampal metabolomics over the day to demonstrate rhythmicity between multiple groups in a large dataset.

bigmeta	<i>Descriptional metadata for the 'bigdata' object, for the purpose of demonstration.</i>
---------	---

Description

Descriptional metadata for the 'bigdata' object, for the purpose of demonstration.

Usage

```
bigmeta
```

Format

A long format data.frame object with three 113 columns and 94 rows.

Source

Dummy metadata modified from untargeted hippocampal metabolomics over the day

build_kronos_formula	<i>Update 'kronos' formula in light of sine and cosine components</i>
----------------------	---

Description

Update 'kronos' formula.

Usage

```
build_kronos_formula(formula, time, verbose)
```

Arguments

formula	A formula. Use the time function to designate which variable represents time.
time	A string. Should be the column name containing the time values.
verbose	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large data sets.

`delistKronos_groupwise`*Get Results from list of KronosOut Objects*

Description

These functions provides a unified wrapper to retrieve results from a list of kronosOut objects.

Usage

```
delistKronos_groupwise(kronos_list, padjust = TRUE)
```

Arguments

<code>kronos_list</code>	a list of preferably named kronosOut objects.
<code>padjust</code>	a boolean. Toggles FDR using Benjamini Hochbergs procedure.

Value

A table with circadian output stats per group per feature.

`delistKronos_pairwise` *Get Results from list of KronosOut Objects*

Description

These functions provides a unified wrapper to retrieve results from a list of kronosOut objects.

Usage

```
delistKronos_pairwise(kronos_list, padjust = TRUE)
```

Arguments

<code>kronos_list</code>	a list of preferably named kronosOut objects.
<code>padjust</code>	a boolean. Toggles FDR using Benjamini Hochbergs procedure.

Value

ANOVA-like adjusted p-values for how each factor interacts with time.

fit_cosinor_model	<i>Fit cosinor model</i>
-------------------	--------------------------

Description

Fit cosinor model for totality of data

Usage

```
fit_cosinor_model(
  formula,
  data,
  time = NULL,
  verbose = verbose,
  for_pw = FALSE
)
```

Arguments

formula	A formula. Use the <code>time</code> function to designate which variable represents time.
data	Input data
time	A string. Should be the column name containing the time values.
verbose	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large datasets.
for_pw	A boolean. Toggles whether to perform pairwise ANOVAs as a TukeyHSD-like post-hoc.

fit_groupwise_model	<i>Fit cosinor model</i>
---------------------	--------------------------

Description

Fit cosinor model for one aspect of data. Called by main 'kronos' function.

Usage

```
fit_groupwise_model(data, group, time, period, verbose)
```

Arguments

data	input data
group	A character string. Signifies which group will be assessed.
time	A string. Should be the column name containing the time values.
period	A numeric. The length of a period, in the same format as the <code>time</code> parameter.
verbose	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large data sets.

fw_kronos

*Fit a cosinor model and extract relevant parameters on a feature table.***Description**

This wrapper applies `kronos()`, the main workhorse function in the 'kronos' package. It manages the individual functionalities of 'kronos', including rhythmicity analysis and differential rhythmicity.

Usage

```
fw_kronos(
  x,
  formula,
  metadata,
  time = NULL,
  period = 24,
  verbose = FALSE,
  pairwise = FALSE
)
```

Arguments

<code>x</code>	Input data. A table with rows being features and columns being samples
<code>formula</code>	A formula. Use the <code>time</code> function to designate which variable represents time. Leave the left-hand side of the formula empty as it will be sequentially replaced by every feature in the table.
<code>metadata</code>	A metadata table, with rows being samples and columns being metadata entries
<code>time</code>	A string. Should be the column name containing the time values.
<code>period</code>	A numeric. The length of a period, in the same format as the <code>time</code> parameter.
<code>verbose</code>	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large datasets.
<code>pairwise</code>	A boolean. Toggles whether to perform pairwise ANOVAs as a TukeyHSD-like post-hoc.

Value

A list of `kronosOut` S4 objects containing coefficients and all operations.

Examples

```
#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
```

```

getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)

```

getKronos

*Get Results from KronosOut Object***Description**

These functions provides a unified wrapper to retrieve results from a kronosOut object.

Usage

```
getKronos(kronosOut, target)
```

Arguments

kronosOut	a kronosOut output object.
target	the specific entry of the kronosOut object to be extracted.

Value

A data.frame of results.

Examples

```

#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)

```

```

getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)

```

getKronos_fit

Get Results from KronosOut Object

Description

These functions provides a unified wrapper to retrieve results from a `kronosOut` object.

Usage

```
getKronos_fit(kronosOut)
```

Arguments

`kronosOut` a `kronosOut` output object.

Value

The model fit used.

Examples

```

#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:

```

```

gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)

```

getKronos_groupwise *Get Results from KronosOut Object*

Description

These functions provides a unified wrapper to retrieve results from a kronosOut object.

Usage

```
getKronos_groupwise(kronosOut)
```

Arguments

kronosOut a kronosOut output object.

Value

Rhythmicity parameters per group.

Examples

```

#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:

```

```

out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)

```

getKronos_input

Get Results from KronosOut Object

Description

These functions provides a unified wrapper to retrieve results from a kronosOut object.

Usage

```
getKronos_input(kronosOut)
```

Arguments

kronosOut a kronosOut output object.

Value

The data used as input for the model.

Examples

```

#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

```

```
#Extracting data from the output object:  
kronosListToTable(out_list)
```

```
#Plotting:  
gg_kronos_acrogram(out_list)
```

getKronos_pairwise	<i>Get Results from KronosOut Object</i>
--------------------	--

Description

These functions provides a unified wrapper to retrieve results from a kronosOut object.

Usage

```
getKronos_pairwise(kronosOut)
```

Arguments

kronosOut a kronosOut output object.

Value

Pairwise comparisons between groups.

Examples

```
#Load prepared data stored in 'kronos' library  
data("kronos_demo")  
output <- kronos(formula = Variable_1 ~ time(Timepoint),  
data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)  
  
#Extracting data from the output object:  
getKronos_fit(output)  
getKronos_trace(output)  
getKronos_groupwise(output)  
  
#Plotting:  
gg_kronos_circle(output)  
gg_kronos_sinusoid(output)  
  
#For high-dimensional data, use fw_kronos:  
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),  
metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)  
  
#Extracting data from the output object:  
kronosListToTable(out_list)
```

```
#Plotting:
gg_kronos_acrogram(out_list)
```

getKronos_pairwise_p *Get Results from KronosOut Object*

Description

These functions provides a unified wrapper to retrieve results from a kronosOut object.

Usage

```
getKronos_pairwise_p(kronosOut)
```

Arguments

kronosOut a kronosOut output object.

Value

ANOVA-like adjusted p-values for how each factor interacts with time.

Examples

```
#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

`getKronos_params`*Get Results from KronosOut Object*

Description

These functions provides a unified wrapper to retrieve results from a `kronosOut` object.

Usage

```
getKronos_params(kronosOut)
```

Arguments

`kronosOut` a `kronosOut` output object.

Value

The names and values of additional circadian model parameters, mostly for plotting purposes.

Examples

```
#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

`getKronos_trace`*Get Results from KronosOut Object*

Description

These functions provides a unified wrapper to retrieve results from a `kronosOut` object.

Usage

```
getKronos_trace(kronosOut)
```

Arguments

`kronosOut` a `kronosOut` output object.

Value

The traces per group for plotting.

Examples

```
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

get_cos_sine	<i>Get sine and cosine components</i>
--------------	---------------------------------------

Description

Based on 'cosinor' and 'limorhyde' packages

Usage

```
get_cos_sine(data, period, colnamePrefix = NULL)
```

Arguments

data	input data
period	A numeric. The length of a period, in the same format as the time parameter.
colnamePrefix	A character string. Typically the name of the "Time" variable.

get_vars	<i>Figure out what variable represents time. Called by main 'kronos' function.</i>
----------	--

Description

Extracts time from the formula and from the time argument. Also handles inconsistencies.

Usage

```
get_vars(formula, time, data, verbose = verbose)
```

Arguments

formula	A formula. Use the time function to designate which variable represents time.
time	A string. Should be the column name containing the time values.
data	input data
verbose	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large data sets.

gg_kronos_acrogram	<i>A plotting method for acrophase circleplots using 'ggplot2'.</i>
--------------------	---

Description

Wrapper around 'ggplot2' to make circadian circleplots.

Usage

```
gg_kronos_acrogram(kronosOutList)
```

Arguments

kronosOutList A list of KronosOut output objects from the main kronos function.

Value

a 'ggplot2' compatible object.

Examples

```
#Load prepared data stored in Kronos library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

gg_kronos_circle	<i>A plotting method for circadian plots using 'ggplot2'.</i>
------------------	---

Description

Wrapper around 'ggplot2' to make circadian circleplots.

Usage

```
gg_kronos_circle(kronosOut)
```

Arguments

kronosOut an output object from the main kronos function.

Value

a 'ggplot2' compatible object.

Examples

```
#Load prepared data stored in Kronos library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

gg_kronos_sinusoid	<i>A plotting method for circadian plots using 'ggplot2'.</i>
--------------------	---

Description

Wrapper around 'ggplot2' to make figures with a sinusoid trace.

Usage

```
gg_kronos_sinusoid(kronosOut, fill = "unique_group")
```

Arguments

kronosOut	an output object from the main kronos function.
fill	The name of the variable that should be used to mark different groups. In the case of a single group, leave empty.

Value

a 'ggplot2' compatible object.

Examples

```
#Load prepared data stored in Kronos library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

groupdata	<i>Snippet of example data to demonstrate the functionality of 'kronos' between and among three different groups</i>
-----------	--

Description

Snippet of example data to demonstrate the functionality of 'kronos' between and among three different groups

Usage

```
groupdata
```

Format

A long format data.frame object with three columns, and 94 rows, samples.

Source

Dummy data modified from PCR analysis of mouse ileum over the day to demonstrate rhythmicity between multiple groups.

kronos	<i>Fit a cosinor model and extract relevant parameters</i>
--------	--

Description

This is the main workhorse function in the 'kronos' package. It manages the individual functionalities of 'kronos', including rhythmicity analysis and differential rhythmicity.

Usage

```
kronos(
  formula,
  data,
  time = NULL,
  period = 24,
  verbose = TRUE,
  pairwise = TRUE
)
```

Arguments

formula	A formula. Use the time function to designate which variable represents time.
data	input data
time	A string. Should be the column name containing the time values.
period	A numeric. The length of a period, in the same format as the time variable
verbose	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large data sets.
pairwise	A boolean. Toggles whether to perform pairwise ANOVAs as a TukeyHSD-like post-hoc.

Value

A kronosOut S4 object containing coefficients and all operations.

Examples

```
#Load prepared data stored in Kronos library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

kronosListToTable	<i>Wrangle results from list of KronosOut Objects to publication ready table.</i>
-------------------	---

Description

These functions provides a unified wrapper to retrieve results from a list of kronosOut objects.

Usage

```
kronosListToTable(kronos_list, padjust = TRUE)
```

Arguments

`kronos_list` a list of preferably named kronosOut objects.
`padjust` a boolean. Toggles FDR using Benjamini and Hochbergs procedure.

Value

A table with circadian output stats per group per feature.

Examples

```
#Load prepared data stored in 'kronos' library
data("kronos_demo")
output <- kronos(formula = Variable_1 ~ time(Timepoint),
  data = onevariable, period = 24, verbose = TRUE, pairwise = FALSE)

#Extracting data from the output object:
getKronos_fit(output)
getKronos_trace(output)
getKronos_groupwise(output)

#Plotting:
gg_kronos_circle(output)
gg_kronos_sinusoid(output)

#For high-dimensional data, use fw_kronos:
out_list = fw_kronos(x = bigdata[1:50,], formula = ~ Group + time(Timepoint),
  metadata = bigmeta, period = 24, verbose = FALSE, pairwise = TRUE)

#Extracting data from the output object:
kronosListToTable(out_list)

#Plotting:
gg_kronos_acrogram(out_list)
```

kronosOut-class	<i>An S4 class to contain all output parameters and plotting information from the 'kronos' main pipeline</i>
-----------------	--

Description

kronosOut is the main output container of the main 'kronos' functions.

Slots

input A data.frame with the data that was fed to the main workhorse function as 'x'
 fit An lm fit for the entire model for the purpose of assessing differential rhythmicity.
 to_plot A data.frame with the traces required to plot individual sinusoid curves
 ind_fit A data.frame with the parameters from individual rhythmic model fits.
 pairwise_t A data.frame with the p.values for pairwise comparisons, if applicable.

kronos_anova	<i>Extract p-value from full fit</i>
--------------	--------------------------------------

Description

Compute p-values from full fit.

Usage

```
kronos_anova(fit, time)
```

Arguments

fit	A lm model fit.
time	A string. Should be the column name containing the time values.

kronos_predict	<i>Give tracing information for plotting purposes</i>
----------------	---

Description

Generate data needed to plot cosinor trace line.

Usage

```
kronos_predict(fit, period, time, factors, verbose = verbose)
```

Arguments

fit	A model fit
period	A numeric. The length of a period, in the same format as the time parameter.
time	A string. Should be the column name containing the time values.
factors	A vector. The names of the independent variables.
verbose	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large data sets.

onevariable	<i>Snippet of example data to demonstrate the functionality of 'kronos' in the most simple scenario.</i>
-------------	--

Description

Snippet of example data to demonstrate the functionality of 'kronos' in the most simple scenario.

Usage

```
onevariable
```

Format

A long format data.frame object with three columns, and 31 rows, samples.

Source

Dummy data modified from metagenomic analysis of mouse caecal contents over the day to demonstrate rhythmicity within one group.

pairwise_cosinor_model	<i>Fit pairwise cosinor models as some sort of TukeyHSD.</i>
------------------------	--

Description

Fit cosinor model for subset of data. Called by main 'kronos' function.

Usage

```
pairwise_cosinor_model(data, formula, time, verbose)
```

Arguments

data	input data
formula	A formula. Use the time function to designate which variable represents time.
time	A string. Should be the column name containing the time values.
verbose	A boolean. Toggles whether to print diagnostic information while running. Useful for debugging errors on large data sets.

`show, kronosOut-method` *Show method for kronosOut object.*

Description

method to print `kronosOut` object by calling `show`. Since `kronosOut` objects are typically unwieldy, also gives some tips on how to handle it.

Usage

```
## S4 method for signature 'kronosOut'
show(object)
```

Arguments

`object` An `kronosOut` object.

Value

Does not return anything, for efficiency reasons. The obvious side effect is output to the terminal.

<code>twowaydata</code>	<i>Snippet of example data to demonstrate the functionality of 'kronos' in the two-factor design scenario.</i>
-------------------------	--

Description

Snippet of example data to demonstrate the functionality of 'kronos' in the two-factor design scenario.

Usage

```
twowaydata
```

Format

A wide format `data.frame` object with nine columns, and 150 rows, samples.

Source

Dummy data modified from metagenomic analysis of mouse caecal contents over the day to demonstrate rhythmicity within one group.

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