Cookbook

My Subtitle

Márton Kiss

4242 november 20.

Contents

Date: _____ Signature: _____

Version control

v.1.0 – Initial version

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1 Results

1.1 Executive summary

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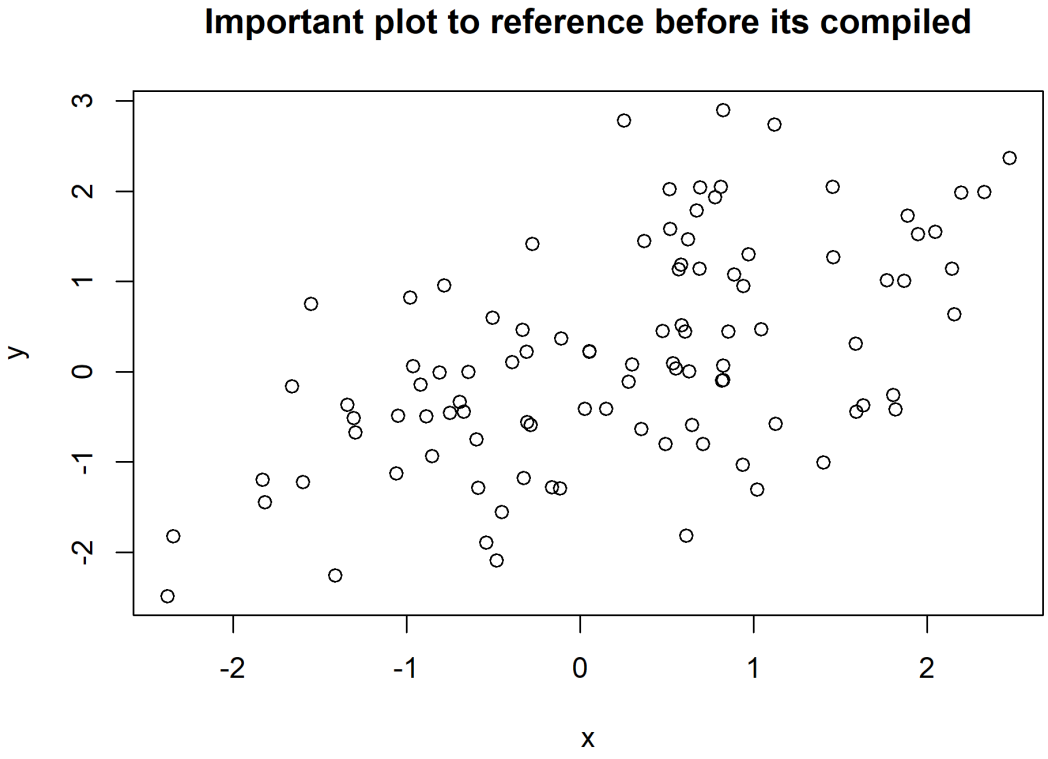

Figure 1: Executive graph for executive thoughts

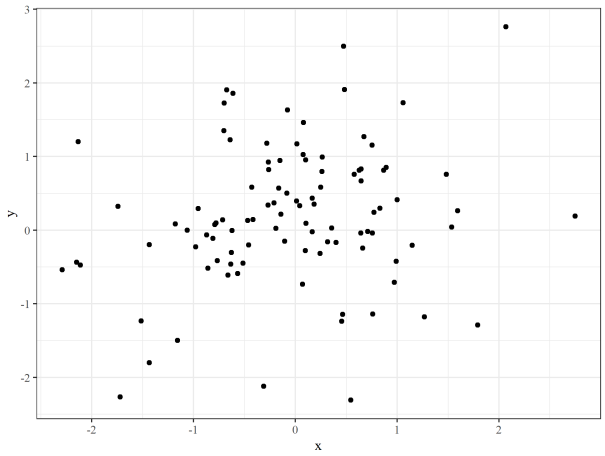

Figure 2: Plot the first

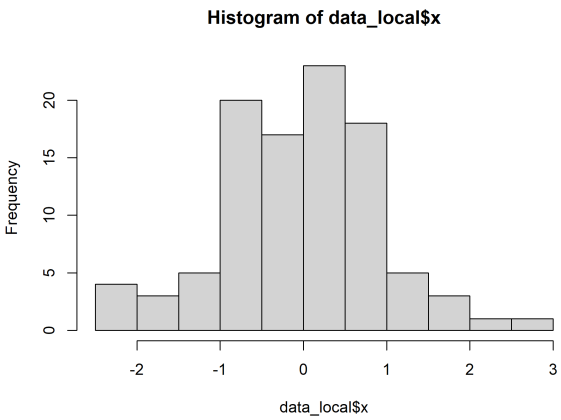

Figure 3: Plot the second

1.2 Introduction

```
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Links can be given in this format (for html versions): link

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1.3 Deviations from the Protocol

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1.4 Planned investigations

If you're feeling cocky, spruce up your report with model descriptions in Latex, eg.:

$$
\begin{aligned}
FPR &= \frac{FP}{N} = \frac{FP}{FP + TN} \\
TPR &= \frac{TP}{P} = \frac{FP}{FP + FN}
\end{aligned}
\tag{1}
$$

$$
\begin{aligned}
log(Cool\ variable_{i,j}) = \alpha_0 + \alpha_1 \times Independent\ variable_1 + \\
\alpha_2 \times Independent\ variable_{2,i,j} + \alpha_3 \times Sex_i + \\
\alpha_2 \times Independent\ variable_{3,i,j} * \alpha_{3,k} \times Treatment + \\
\delta_{0,i} + \delta_{1i} \times j + \epsilon_{i,j}
\end{aligned}
$$

where,

- **i** is the subject number,
- **j** is the time point,
- **k** is the treatment,
- ϵ is the residual error, and
- δ represents the random effects.

1.5 Chapter title

1.5.1 Relevelling

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Sorry, the below is a dull example of releveling:

```
# This is an example of factor releveling snatched from
# https://www.tutorialspoint.com/r/r_factors.htm

data_f <- c("East", "West", "East", "North", "North", "East",
    "West", "West", "West", "East", "North")
# Create the factors
factor_data <- factor(data_f)
print(factor_data)
```

```
##  [1] East  West  East  North North East  West  West  West  East  North
## Levels: East North West
```

```r
# Apply the factor function with required order of the
# level.
new_order_data <- factor(factor_data, levels = c("East", "West",
    "North"))
print(new_order_data)
```

```
##  [1] East  West  East  North North East  West  West  West  East  North
## Levels: East West North
```

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1.5.2 Side-by-side log graphs

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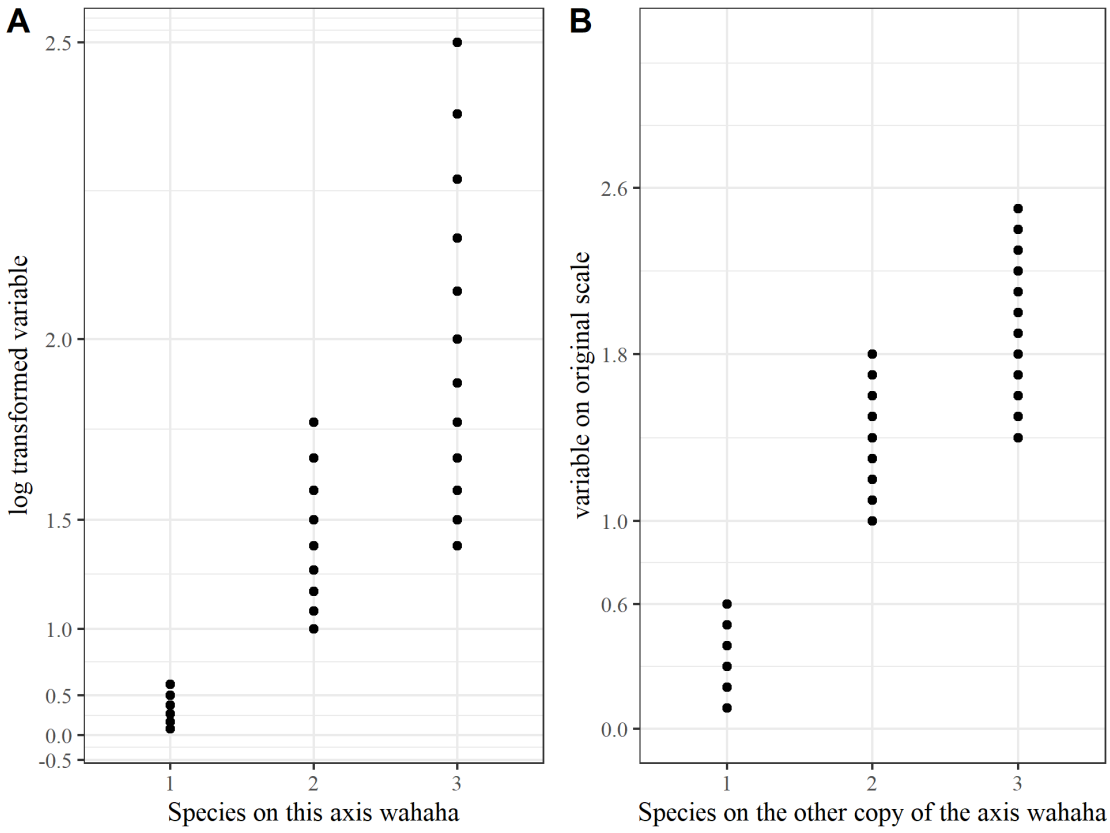

Figure 4: Title of the plot above

1.5.3 Side by side different graphs, different fig. title

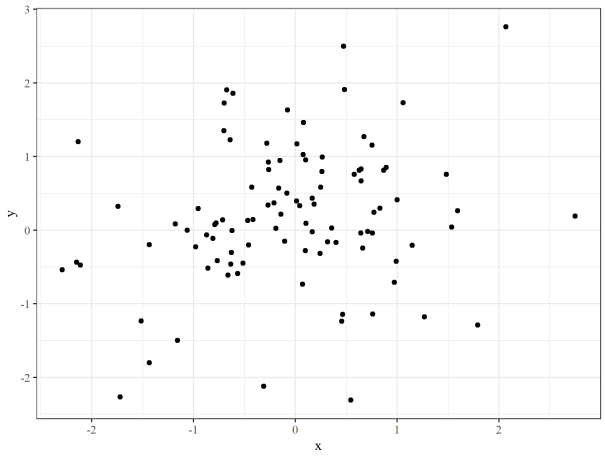

Figure 5: Plot the first

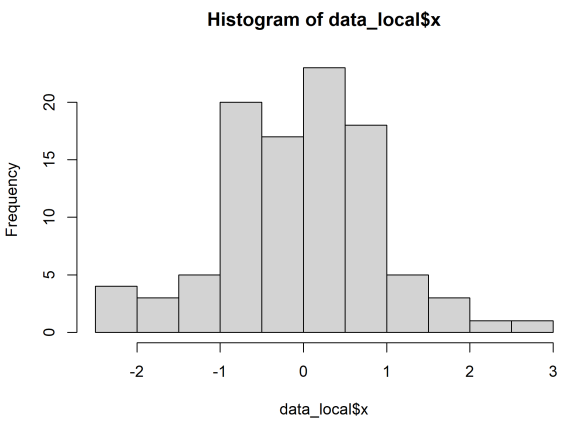

Figure 6: Plot the second

1.5.4 A tbl_summary example

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1.5.5 A raincloud plot

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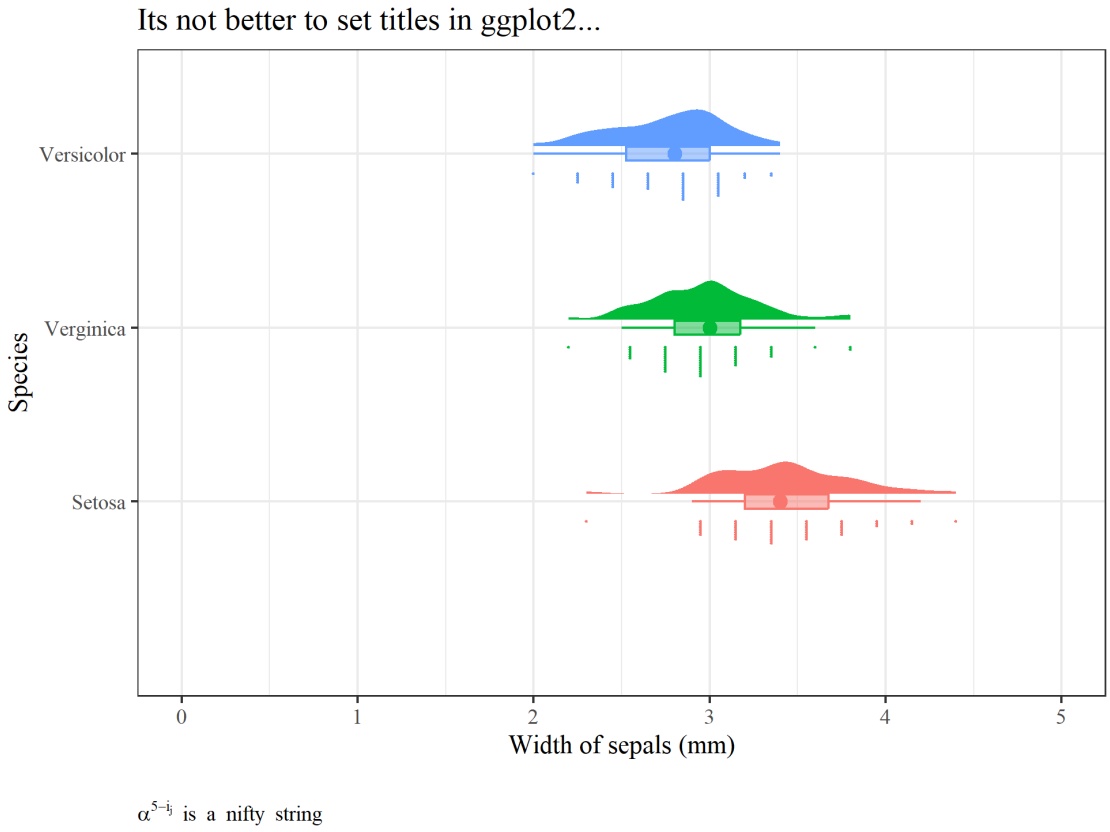

Figure 7: Raincloud plot(!)

1.5.6 Mixed model specification

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These are some texts.

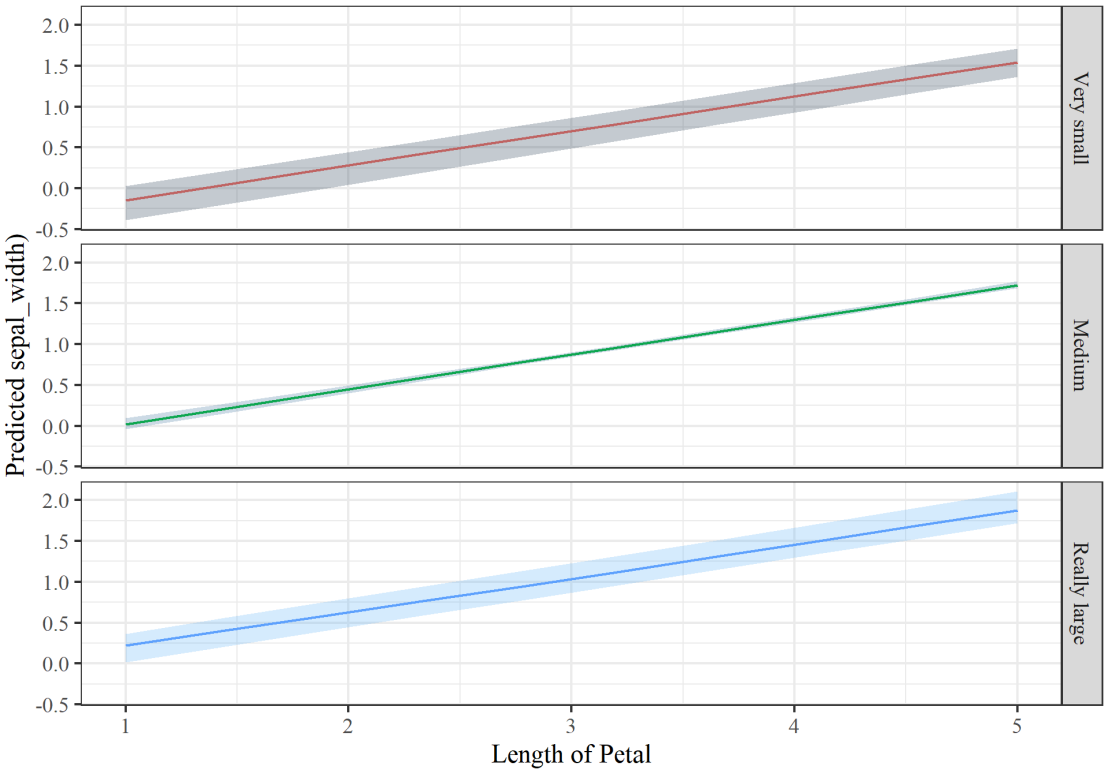
Specification of an lmer model

	Width of petal (mm)	
Predictors	*Estimates*	*CI*
Interceeeeept	-0.70	-0.99 – -0.47
Length of petal	0.42	0.41 – 0.45
Width of sepal	0.10	0.03 – 0.17
Random Effects		
σ^2	0.041	
$\tau_{00\ mock\_ID}$	0.000	
$N_{\ mock\_ID}$	21	
Observations	150	
Marginal R^2 / Conditional R^2	0.929 / NA	

Figure 8: Ezt nem az R készítette

Cashycashing. . . .

plottyplotting. . .



Confidence bands are conditional on the random effects(?)

Figure 9: lmer predictions with bootstrap and labelled facets

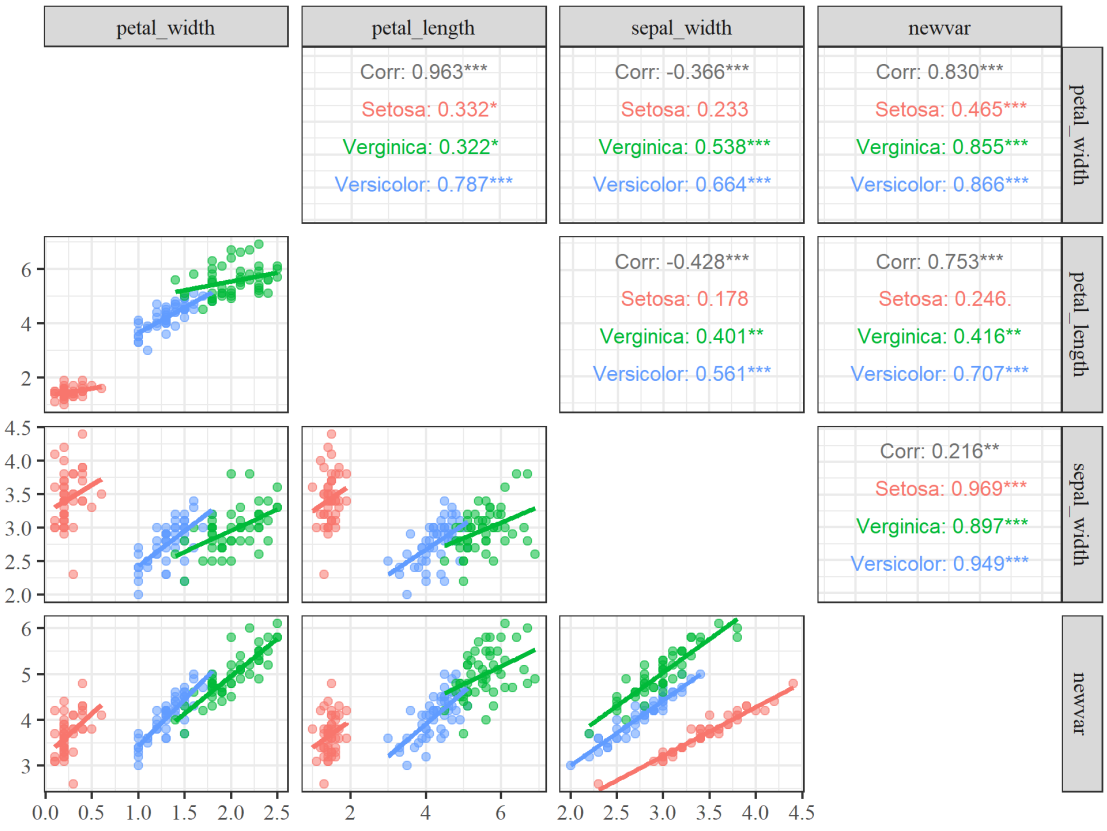


Figure 10: Especially Cool 'pairs' plot

Table 1: Plot without much thought or meaning

	Setosa, N = 50	**Verginica, N = 50**	**Versicolor, N = 50**
Numeric representation of species			
1	50 (100%)	0 (0%)	0 (0%)
2	0 (0%)	0 (0%)	50 (100%)
3	0 (0%)	50 (100%)	0 (0%)
These are the width of the petals	0.20 (0.20, 0.30)	2.00 (1.80, 2.30)	1.30 (1.20, 1.50)
These are the length of the petals	1.50 (1.40, 1.58)	5.55 (5.10, 5.88)	4.35 (4.00, 4.60)
These are the width of the sepals	3.40 (3.20, 3.68)	3.00 (2.80, 3.18)	2.80 (2.53, 3.00)
These are the length of the sepals	5.00 (4.80, 5.20)	6.50 (6.23, 6.90)	5.90 (5.60, 6.30)
This is a date column to illustrate transformations	2022-01-01 to 2022-02-19	2022-04-11 to 2022-05-30	2022-02-20 to 2022-04-10
This is my new example variable, adding up the lengths	3.70 (3.40, 3.90)	4.95 (4.63, 5.38)	4.20 (3.73, 4.40)
mock_ID	9.0 (5.0, 11.0)	11.0 (7.3, 15.0)	9.5 (5.3, 14.0)

Table 2: Dis be the second table

mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
21	6	160	110	3.9	2.62	16.46	0	1	4	4
21	6	160	110	3.9	2.875	17.02	0	1	4	4
22.8	4	108	93	3.85	2.32	18.61	1	1	4	1
21.4	6	258	110	3.08	3.215	19.44	1	0	3	1
18.7	8	360	175	3.15	3.44	17.02	0	0	3	2
18.1	6	225	105	2.76	3.46	20.22	1	0	3	1

1.5.7 cyl

Table 3: Frequency of cyl categories

	N = 32
cyl	
4	11 (34%)
6	7 (22%)
8	14 (44%)

1.5.7.1 Table

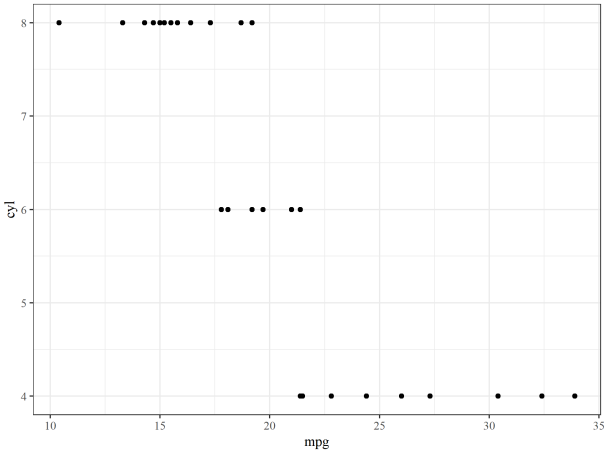


Figure 11: Bal oldali ábra

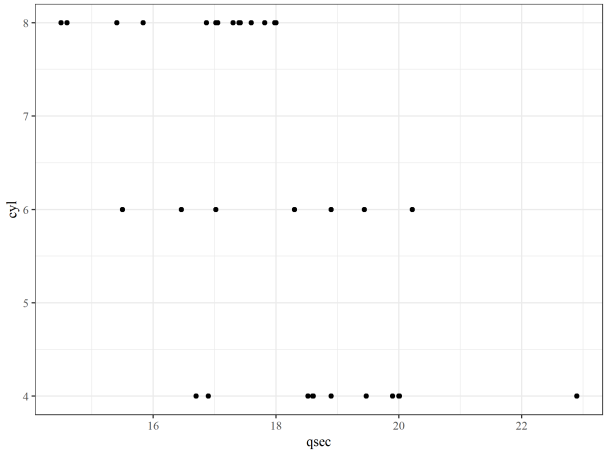


Figure 12: Jobb oldali ábra

1.5.7.2 Figures

És még hivatkozni is tudunk a(z) **??**. ábrára.

1.5.8 gear

1.5.8.1 Table

1.5.8.2 Figures

És még hivatkozni is tudunk a(z) **??**. ábrára.

1.5.9 carb

1.5.9.1 Table

1.5.9.2 Figures

És még hivatkozni is tudunk a(z) **??**. ábrára.

Table 4: Frequency of gear categories

	N = 32
gear	
3	15 (47%)
4	12 (38%)
5	5 (16%)

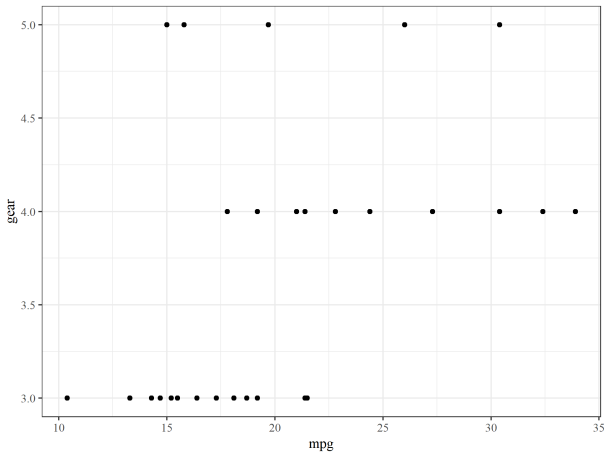


Figure 13: Bal oldali ábra

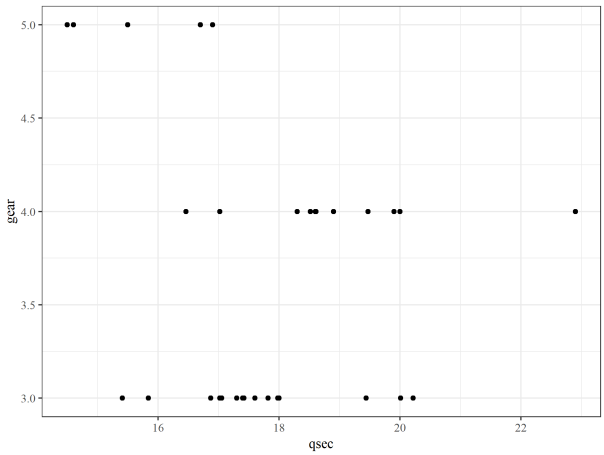


Figure 14: Jobb oldali ábra

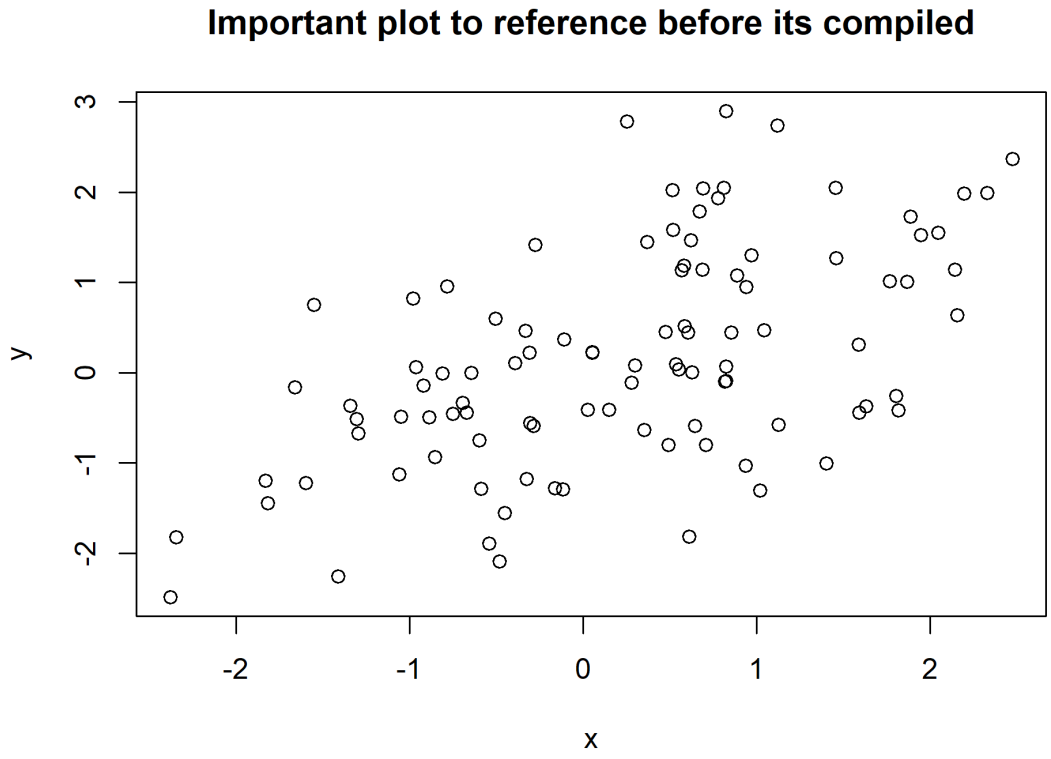


Figure 17: Executive graph for executive thoughts

Table 5: Frequency of carb categories

	N = 32
carb	
1	7 (22%)
2	10 (31%)
3	3 (9.4%)
4	10 (31%)
6	1 (3.1%)
8	1 (3.1%)

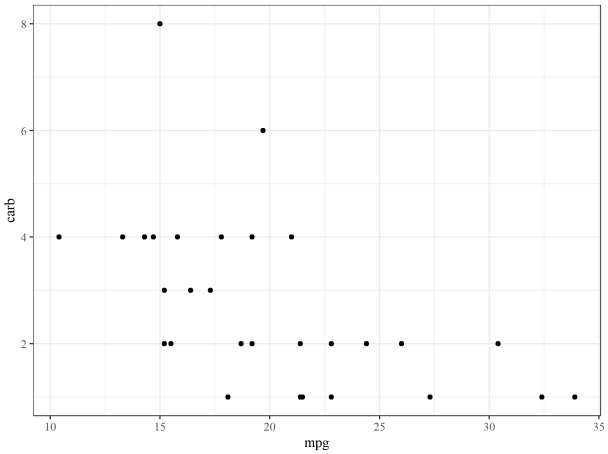


Figure 15: Bal oldali ábra

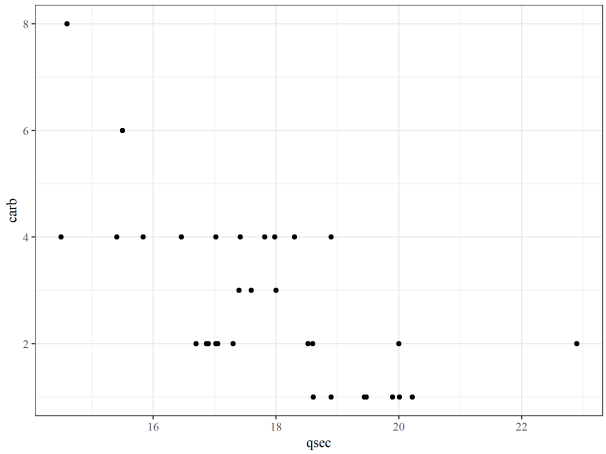


Figure 16: Jobb oldali ábra

2 Notes

The MD5 checksum of the database used:

```
## C:/OneDrive_DKM/-/Dinamikus Kiválóság Menedzsment - General/Stats_R/R/MartysCookbook/inst/extdata/Ir
##                                                                                    "1ed4b9d5418675e017479de339a
```

Other information regarding the compilation of this document:

Analyses were conducted using the R Statistical language (version 4.3.0; R Core Team, 2023) on Windows 10 x64 (build 19045), using the packages lme4 (version 1.1.33; Bates D et al., 2015), Matrix (version 1.5.4.1; Bates D et al., 2023), effects (version 4.2.2; Fox J, Weisberg S, 2019), carData (version 3.0.5; Fox J et al., 2022), lubridate (version 1.9.2; Grolemund G, Wickham H, 2011), DHARMa (version 0.4.6; Hartig F, 2022), huxtable (version 5.5.2; Hugh-Jones D, 2022), labelled (version 2.11.0; Larmarange J, 2023), emmeans (version 1.8.6; Lenth R, 2023), nlme (version 3.1.162; Pinheiro J et al., 2023), gtsummary (version 1.7.1; Sjoberg D et al., 2021), ggplot2 (version 3.4.2; Wickham H, 2016), readxl (version 1.4.2; Wickham H, Bryan J, 2023), roxygen2 (version 7.2.3; Wickham H et al., 2022), dplyr (version 1.1.2; Wickham H et al., 2023) and knitr (version 1.43; Xie Y, 2023).

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This document was compiled at:

```
[1] "2023-06-08 16:40:28 CEST"
```

3 Appendix

This is how put all your code into an appendix.

```
# https://dotcms.com/docs/latest/markdown-syntax
# https://yihui.org/knitr/options/
# https://zbib.org/
# https://www.r-bloggers.com/2019/09/first-world-problems-very-long-rmarkdown-documents/


# # For citations insert this into the yaml header (without spaces)
# # And make a book.bib file to the location of the mother .rmd
# bibliography: book.bib
# biblio-style: apalike
```

```
# link-citations: yes

source(here::here("inst","functions","load_stuff.r"))

knitr::opts_chunk$set(
    echo = FALSE,                           # Ne mutassa a kódokat
    cached = FALSE,                ###!!!  # Ne cache-eljen
    warning = FALSE,                        # Ne írja ki a warningokat
    message = FALSE,
    fig.align = 'center',                   # Ábra középre rendezése
    out.width = '90%',                      # Ábra szélessége, alter.: #fig.fullwidth = TRUE,
    fig.asp = .75,                          # Ábra Hossz/szélesség
    tidy.opts = list(width.cutoff = 60),    # legyenek 60 karakter szélességűre tördelve
    tidy = "styler",                        # legyenek clean codingra megformázva
    dev = 'png',#'tiff',                            # PNG legyen az alapértelmezett képformátum
    compression = 'lzw',
    dpi = 300,                              # a PNG képek elég jó minőségűek legyenek
    fig.pos = 'H'                           # nem próbálja az ábrákat az oldal tetejére tenni
  )


graphics_path <- "../inst/figures/"            # a máshonnan származó ábrák elérési útja
graphics_output_path <- "cookbook_files/figure-latex/" # az itt generált ábrák elérési útja

options(scipen = 1) # Require 5 instead of 4 for scientific notation (eg. for p-values)
options(digits = 3) # default no. of digits (!)
options(encoding = "UTF-8")

plot(x,y)

save.image( file = here::here("inst","states", "before_chap1.Rdata"))

valtozok <- c("cyl", "gear", "carb")
out <- NULL

for (i in 1:length(valtozok)) {
  out <- c(out, paste0("\n### ", valtozok[i], "\n")) # Defining "title"
  params <- list(x              = valtozok[i],
                 top_level      = 4,
                 figname_prefix = valtozok[i])
  out <- c(out,
           knitr::knit_child(here::here("inst",'cyclic_chap2.Rmd'),
                             quiet = T))
}
out <- paste(out, collapse = "\n")

set.seed(12345)

x <- rnorm(100)
y <- 0.5 * x + rnorm(100)

plot(x,y, main = "Important plot to reference before its compiled")
```

```
tools::md5sum(here::here("inst","extdata","Iris.xls"))
knitr::opts_chunk$set(comment = NA)
sessionInfo() %>% report::report() %>% cat()

Sys.time()
save.image(file = here::here("inst","states","cookbook_out.Rdata"))



source(here::here("inst","functions","load_stuff.r"))
load( file = here::here("inst","states", "before_chap1.Rdata"))

graphics_output_path <- "cookbook_files/figure-latex/" # az itt generált ábrák elérési útja

# This is an example of factor releveling snatched from
# https://www.tutorialspoint.com/r/r_factors.htm

data_f <- c("East","West","East","North","North","East","West",
   "West","West","East","North")
# Create the factors
factor_data <- factor(data_f)
print(factor_data)

# Apply the factor function with required order of the level.
new_order_data <- factor(factor_data,levels = c("East","West","North"))
print(new_order_data)



# First subplot
fig_1a <-
data %>%
  ggplot( aes( x = species_no,
               y = petal_width)) +
  # Theme
  theme_default_ggplot +
  # Layers
  geom_point() +
  # axis wrangling
  scale_y_continuous(
    # setting up a custom log transform ( the pre-defined results in error somehow...)
    trans = scales::trans_new("expmar", exp,
            function(x){
                #print(paste("isq",x))  #debug statement
                x <-ifelse(x<0, 0, x)
                log(x)
              })
  ) +
  # description(s)
  labs( x = "Species on this axis wahaha",
        y = "log transformed variable")
```

```r
# Second subplot
fig_1b <-
data %>%
  ggplot( aes( x = species_no,
               y = petal_width)) +
  # Theme
  theme_default_ggplot +
  theme( legend.position="bottom") + # custom legend position if needed
  # Layers
  geom_point() +
  # axis wrangling
  scale_y_continuous(
    limits = c( 0,3.3),
    breaks = c( 0, .6, 1, 1.8, 2.6)
  ) +
  # description(s)
  labs( x = "Species on the other copy of the axis wahaha",
        y = "variable on original scale")

# Demonstrating arranging plots
fig_1comp <-
  ggpubr::ggarrange(fig_1a, fig_1b,
          #labels = c("", ""), # if you'd like to omit the labels
          labels = "AUTO",
          ncol = 2, nrow = 1)

# calling the plot
(fig_1comp)


data_local <- data.frame( x = rnorm(100)) %>%
                mutate(y = x * 0.5 + rnorm(100))

data_local %>%
  ggplot( aes(x=x,y=y)) +
    theme_default_ggplot +
    geom_point()

hist(data_local$x)



tbl_summary( data, by = species_char) %>%
  martys_table_style(caption. =
                       "Plot without much thought or meaning") %>%
  # You can 'overwrite' setting which don't conflict your defaults
  set_font_size(7) %>%
  ###### row_spec(0, bold = T, font_size = 7)# %>% # Dis crashes the whole thing
   set_width(.4)


head(mtcars) %>%
  martys_table_style(caption. = "Dis be the second table")
```

```r
# Calling the plot
plot. <-
  data %>%
    ggplot( aes(x = species_char, y = sepal_width,
                color = species_char, fill = species_char)) +
    theme_default_ggplot +
    # half smoothed density
    ggdist::stat_halfeye(
      ## bandwidth
      adjust = 0.6,
      justification = -.2,
      .width = 0,
      width = .25
    ) +
    # Boxplot
    geom_boxplot( width = .08,
                  # remove outliers from boxplot
                  outlier.color = NA,
                  alpha = .5) +
    # Dotplot
    ggdist::stat_dots(
      side = "left",
      dotsize = .1,
      justification = 1.12,
      binwidth = .125
    ) +
    labs(
      # coord_flip doesn't affect this ;)
      x = "Species",
      y = "Width of sepals (mm)",
      # Including latex, see https://cran.r-project.org/web/packages/latex2exp/vignettes/using-latex2ex
      caption = latex2exp::TeX(r"($   \alpha^{5-i_j}\ is\ a\ nifty\ string   $)"),
      title = "Its not better to set titles in ggplot2..."
      ) +
    scale_y_continuous(
      breaks = c(0,1,2,3,4,5),
      limits = c(0,5)) +
    coord_flip()


(plot.)


library(lme4)

mod <- lmer(
  petal_width ~
    petal_length +
    sepal_width +
    (1 | mock_ID),
  data
```

```
)


#Output is in html...
sjPlot::tab_model(mod,
    # transform = "exp", # makes stuff multiplicative
    digits.re = 3,
    show.reflvl = TRUE,
    pred.labels = list(
      `(Intercept)` = "Interceeeeept",
      petal_length  = "Length of petal",
      sepal_width   = "Width of sepal"
    ),
    dv.labels = "Width of petal (mm)",
    df.method = "kr", # makes it somewhat more conservative I guess
    title = "Specification of an lmer model"
    , show.p = FALSE # if you're also skeptical of p-values
    , bootstrap = TRUE
    , iterations = 100 # actually works for lmer(!)
    , file = here::here("inst","stuff","temp.html") # have to export temporarily
  )


  # The "webshot2" stuff needs to be done 'invisibly' or else it
  # spawns a copy of the previous image
invisible({
  #taking a 'snapshot' of the html and converting it to .png
  webshot2::webshot(url=here::here("inst","stuff","temp.html"),
                    cliprect = c(0,0,400,400),
                    file = here::here("inst","figures","webshot.png"))
})



# How to predict an lmer model's main effects based on bootstrap
# slow as it gets if you like it pretty, introducing cache

CRANK <- 30

pred <- expand.grid(
  petal_length = seq(1, 5, length.out = 10),
  sepal_width  = seq(1, 5, length.out = 3)
)

pred_out <- ciTools::add_ci(pred, mod,
  includeRanef = FALSE, type = "boot",
  nSims = CRANK # crank up in production
)

# fig.show='hide'

plot_lmeoutpred <-
  pred_out %>%
```

```
    mutate(
      # Recoding into factor the facetting value, labels will be based on the labels...
      sepal_width2 = factor( sepal_width, labels = c("Very small",
                                                     "Medium",
                                                     "Really large"))) %>%
    ggplot( aes(x = petal_length, y = pred,
                group = sepal_width2, color = sepal_width2
                , fill = sepal_width)) +
    theme_default_ggplot +
    geom_line() +
    geom_ribbon(mapping = aes( ymin = LCB0.025,
                               ymax = UCB0.975),
                alpha = .25,
                colour = NA) +
    facet_grid( facets = c("sepal_width2"), labeller = label_value) +
    labs( x = "Length of Petal",
          y = "Predicted sepal_width)",
          caption = "Confidence bands are conditional on the random effects(?)")

plot_lmeoutpred

#|fig.cap="lmer predictions with bootstrap and labelled facets",
#|fig.keep ='all'
#|

(plot_lmeoutpred)


# The below is an analogue of pairs()

plot_ggpairs <-
  data %>%
    select(c(
      "petal_width",  "petal_length", "sepal_width", "newvar", "species_char"
    )) %>%
    GGally::ggpairs( .,
             aes(color = species_char, alpha = 0.5),
             columns = 1:4,
             upper = list(continuous = GGally::wrap("cor", size = 3)),
             diag =  list(continuous = "blankDiag"),
             lower = list(continuous = GGally::wrap( "smooth",
                                                     se = FALSE,
                                                     method = "lm")),
             progress = FALSE) +
      theme_default_ggplot


(plot_ggpairs)


# ## Doesn't work in pdf output(?)
#
# library(leaflet)
```

```
#
# leaflet(width = "100%") %>%
#   addProviderTiles("CartoDB.Positron") %>%
#   setView(lat = -27.45, lng = 153.075, 10) %>%
#   addMarkers(lat = -27.45321, lng = 153.0919745, label = "ACC") %>%
#   addMarkers(lat = -27.452607, lng = 153.029548, label = "MLA") %>%
#   addMarkers(lat = -27.589169, lng = 153.107316, label = "Teys")

## Magic mode of failure....
# source(here::here("inst","functions","load_stuff.r"))
# a <- search() %>% data.frame(loaded_packages = .)
# save(a, file = "omgomgomgomg2.rdata")

## MOTHERf... auto-prioritized this chunk and libraries were not loaded.
## Setting up ref. fixed the issue.

fortunes::read.fortunes() %>%
  .[1:50,c(2,1)] %>%
  # Sometimes you have to specify everything if you want to deviate
  # from the standard look (here: do a longtable)
  kable(format = "latex",
                    longtable = TRUE, # Doesn't work with scale_down
                    booktabs = TRUE,
                    linesep = "",
                    caption = "Wise R sayings",
                    align = "c") %>%
  row_spec(0, bold = T) %>%
  kable_styling( position = "center",
                 latex_options = c("striped","repeat_header"
                                   #,"scale_down"
                                   ),
                 stripe_color = "gray!05") %>%
  landscape() %>%
  column_spec(column = 2, width = "50em") %>%
  kable_styling(font_size = 7)



# Defining stuff, including the renaming scheme, and the structure of the output


source(here::here("inst","functions","load_stuff.r")) # for independent compilation
load( file = here::here("inst","states", "before_chap2.Rdata"))

graphics_output_path <- "cookbook_files/figure-latex/" # az itt generált ábrák elérési útja

if(!exists("child_counter")) {
  child_counter <- 1
} else {
  child_counter <- child_counter + 1
}

if(!exists("params")) {
```

```
    params <- list(x              = "cyl",
                   top_level      = 4,
                   figname_prefix = "cyl"
    )
    }

knitr::opts_chunk$set(fig.process = function(x) {
  x2 = sub(paste0(knitr::opts_current$get("label"), '-'), '', x, fixed = T)
  if (file.rename(x, x2)) x2 else x
})

my <- list()
my$table <- t(table(params$x))
rownames(my$table) <- c("Darabszámok")

mtcars[[params$x]] %>%
  as.data.frame %>%
  `colnames<-`(params$x) %>%
  tbl_summary() %>%
  martys_table_style(caption. = paste0("Frequency of ",params$x," categories"))

child_counter <- child_counter + 1

mtcars %>%
  ggplot( aes(x = mpg,
          y = .data[[params$x]])) +
  theme_default_ggplot +
  geom_point()

mtcars %>%
  ggplot( aes(x = qsec,
          y = .data[[params$x]])) +
  theme_default_ggplot +
  geom_point()

rm(my)

knitr::opts_chunk$set(fig.process = NULL)

# Defining stuff, including the renaming scheme, and the structure of the output


source(here::here("inst","functions","load_stuff.r")) # for independent compilation
load( file = here::here("inst","states", "before_chap2.Rdata"))

graphics_output_path <- "cookbook_files/figure-latex/" # az itt generált ábrák elérési útja

if(!exists("child_counter")) {
  child_counter <- 1
} else {
  child_counter <- child_counter + 1
}
```

```
if(!exists("params")) {
    params <- list(x              = "cyl",
                   top_level      = 4,
                   figname_prefix = "cyl"
    )
    }

knitr::opts_chunk$set(fig.process = function(x) {
  x2 = sub(paste0(knitr::opts_current$get("label"), '-'), '', x, fixed = T)
  if (file.rename(x, x2)) x2 else x
})

my <- list()
my$table <- t(table(params$x))
rownames(my$table) <- c("Darabszámok")

mtcars[[params$x]] %>%
  as.data.frame %>%
  `colnames<-`(params$x) %>%
  tbl_summary() %>%
  martys_table_style(caption. = paste0("Frequency of ",params$x," categories"))

child_counter <- child_counter + 1

mtcars %>%
  ggplot( aes(x = mpg,
          y = .data[[params$x]])) +
  theme_default_ggplot +
  geom_point()

mtcars %>%
  ggplot( aes(x = qsec,
          y = .data[[params$x]])) +
  theme_default_ggplot +
  geom_point()

rm(my)

knitr::opts_chunk$set(fig.process = NULL)

# Defining stuff, including the renaming scheme, and the structure of the output


source(here::here("inst","functions","load_stuff.r")) # for independent compilation
load( file = here::here("inst","states", "before_chap2.Rdata"))

graphics_output_path <- "cookbook_files/figure-latex/" # az itt generált ábrák elérési útja

if(!exists("child_counter")) {
  child_counter <- 1
} else {
  child_counter <- child_counter + 1
}
```

```
if(!exists("params")) {
    params <- list(x              = "cyl",
                   top_level      = 4,
                   figname_prefix = "cyl"
    )
    }

knitr::opts_chunk$set(fig.process = function(x) {
  x2 = sub(paste0(knitr::opts_current$get("label"), '-'), '', x, fixed = T)
  if (file.rename(x, x2)) x2 else x
})

my <- list()
my$table <- t(table(params$x))
rownames(my$table) <- c("Darabszámok")

mtcars[[params$x]] %>%
  as.data.frame %>%
  `colnames<-`(params$x) %>%
  tbl_summary() %>%
  martys_table_style(caption. = paste0("Frequency of ",params$x," categories"))

child_counter <- child_counter + 1

mtcars %>%
  ggplot( aes(x = mpg,
          y = .data[[params$x]])) +
  theme_default_ggplot +
  geom_point()

mtcars %>%
  ggplot( aes(x = qsec,
          y = .data[[params$x]])) +
  theme_default_ggplot +
  geom_point()

rm(my)

knitr::opts_chunk$set(fig.process = NULL)
```