

Good practice R coding

Day 1 - Introduction to Data Analysis with R

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Chaotic projects and workflows ...

... can make even small changes frustrating and difficult.



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Background

- Reproducibility 

 - Can someone else reproduce my results?

- Reliability 

 - Will my code work in the future?

- Reusability 

 - Can someone else actually use my code?

First things first

Project setup and structure

Use R Studio projects

Always make your project an R Studio Project (if possible)!

-  You already did that.

Set up your project

R Studio offers a lot of settings and options.

So have a ☕ and check out **Tools -> Global Options** and all the other buttons.

- [R Studio cheat sheet](#) that explains all the buttons
- Update R Studio from time to time to get new settings ([Help -> Check for Updates](#))

Name your files properly

Your collaborators and your future self will love you for this.

Principles ¹

File names should be

1. Machine readable
2. Human readable
3. Working with default file ordering

1. Machine readable file names

Names should allow for easy **searching**, **grouping** and **extracting information** from file names.

- No space & special characters

Bad examples ✗

- 2023-04-20 temperature göttingen.csv
- 2023-04-20 rainfall göttingen.csv

Good examples ✓

- 2023-04-20_temperature_goettingen.csv
- 2023-04-20_rainfall_goettingen.csv

2. Human readable file names

Which file names would you like to read at 4 a.m. in the morning?

- File names should reveal the file content
- Use separators to make it readable

Bad examples 

-  01preparedata.R
-  01firstscript.R

Good examples 

-  01_prepare-data.R
-  01_temperature-trend-analysis.R

3. Default ordering

If you order your files by name, the ordering should make sense:

- (Almost) always put something numeric first
 - Left-padded numbers (01, 02, ...)
 - Dates in YYYY-MM-DD format

Chronological order

-  2023-04-20_temperature_goettingen.csv
-  2023-04-21_temperature_goettingen.csv

Logical order

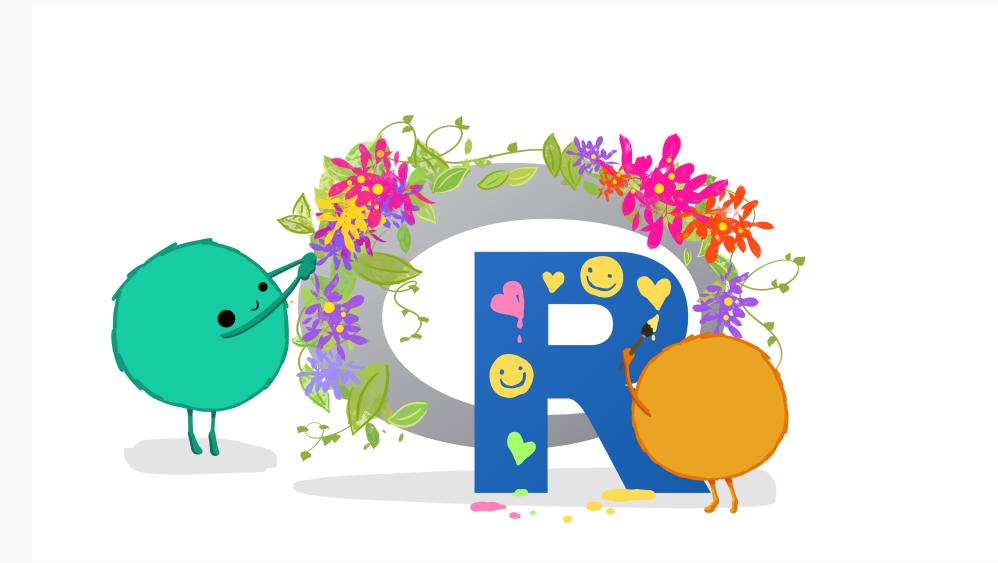
-  01_prepare-data.R
-  02_lm-temperature-trend.R

Let's start coding

Good practice R coding

Write beautiful code

- Try to write code that others (i.e. future you) can understand
 - Follow standards for readable and maintainable code
 - For R: [tidyverse style guide](#) defines code organization, syntax standards,
- ...



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Standard code structure

1. General comment with purpose of the script, author, ...
2. `library()` calls on top
3. Set default variables and global options
4. Source additional code
5. Write the actual code, starting with loading all data files

```
# This code replicates figure 2 from the
# Baldauf et al. 2022 Journal of Ecology paper.
# Authors: Selina Baldauf, Jane Doe, Jon Doe

library(tidyverse)
library(vegan)

# set defaults
input_file <- "data/results.csv"

# source files
source("R/my_cool_function.R")

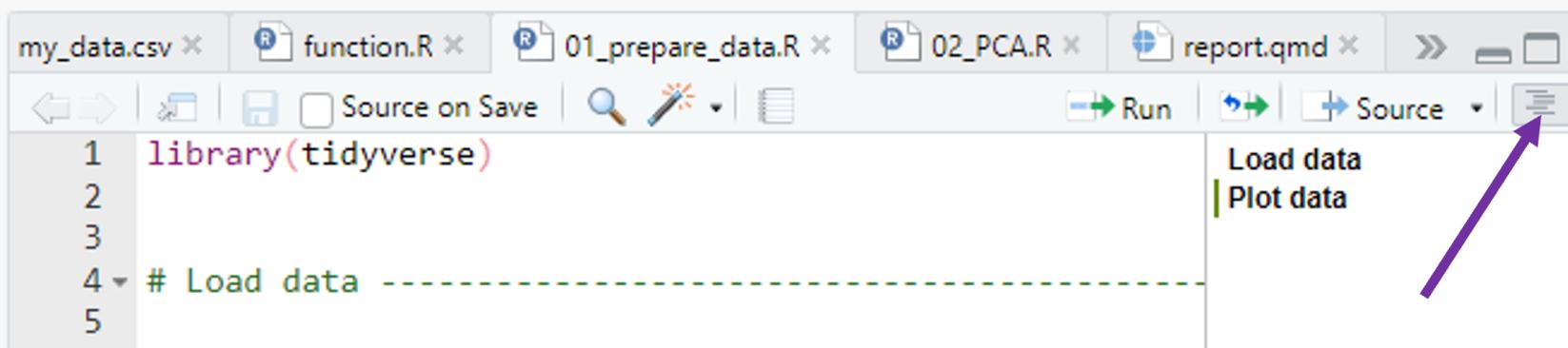
# read input
input_data <- read_csv(input_file)
```

Mark sections

- Use comments to break up your file into sections

```
# Load data -----  
  
input_data <- read_csv(input_file)  
  
# Plot data -----  
  
ggplot(input_data, aes(x = x, y = y)) +  
  geom_point()
```

- Insert a section label with **Ctrl/Cmd + Shift**
- Navigate sections in the file outline



Coding style - Object names

- Variables should only have *lowercase letters, numbers, and *_**
- Use `snake_case` for longer variable names
- Try to use concise but meaningful names

```
# Good
day_one
day_1

# Bad
DayOne
dayone
first_day_of_the_month
dm1
```

Coding style - Spacing

- Always put spaces after a comma

```
# Good
x[, 1]
```

```
# Bad
x[ , 1]
x[, 1]
x[ , 1]
```

Coding style - Spacing

- Always put spaces after a comma
- No spaces around parentheses for normal function calls

```
# Good
mean(x, na.rm = TRUE)

# Bad
mean (x, na.rm = TRUE)
mean ( x, na.rm = TRUE )
```

Coding style - Spacing

- Always put spaces after a comma
- No spaces around parentheses for normal function calls
- Spaces around most operators (<-, ==, +, etc.)

```
# Good
height <- (feet * 12) + inches
mean(x, na.rm = TRUE)

# Bad
height<-feet*12+inches
mean(x, na.rm=TRUE)
```

Coding style - Spacing

- Always put spaces after a comma
- No spaces around parentheses for normal function calls
- Spaces around most operators (<-, ==, +, etc.)
- Spaces before pipe (|>) followed by new line

```
# Good
iris |>
  group_by(Species) |>
  summarize_if(is.numeric, mean) |>
  ungroup()

# Bad
iris |> group_by(Species) |> summarize_all(mean) |> ungroup()
```

Coding style - Spacing

- Always put spaces after a comma
- No spaces around parentheses for normal function calls
- Spaces around most operators (<-, ==, +, etc.)
- Spaces before pipes (|>, |>) followed by new line
- Spaces before + in ggplot followed by new line

```
# Good
ggplot(aes(x = Sepal.Width, y = Sepal.Length, color = Species)) +
  geom_point()

# Bad
ggplot(aes(x = Sepal.Width, y = Sepal.Length, color = Species))+geom_point()
```

Coding style - Line width

Try to limit your line width to 80 characters.

- You don't want to scroll to the right to read all code
- 80 characters can be displayed on most displays and programs
- Split your code into multiple lines if it is too long
 - See this grey vertical line in R Studio?

```
# Bad
iris |>
  group_by(Species) |>
  summarise(Sepal.Length = mean(Sepal.Length), Sepal.Width = mean(Sepal.Width), Species = n_distinct(Species))

# Good
iris |>
  group_by(Species) |>
  summarise(
    Sepal.Length = mean(Sepal.Length),
    Sepal.Width = mean(Sepal.Width),
    Species = n_distinct(Species)
  )
```

Coding style

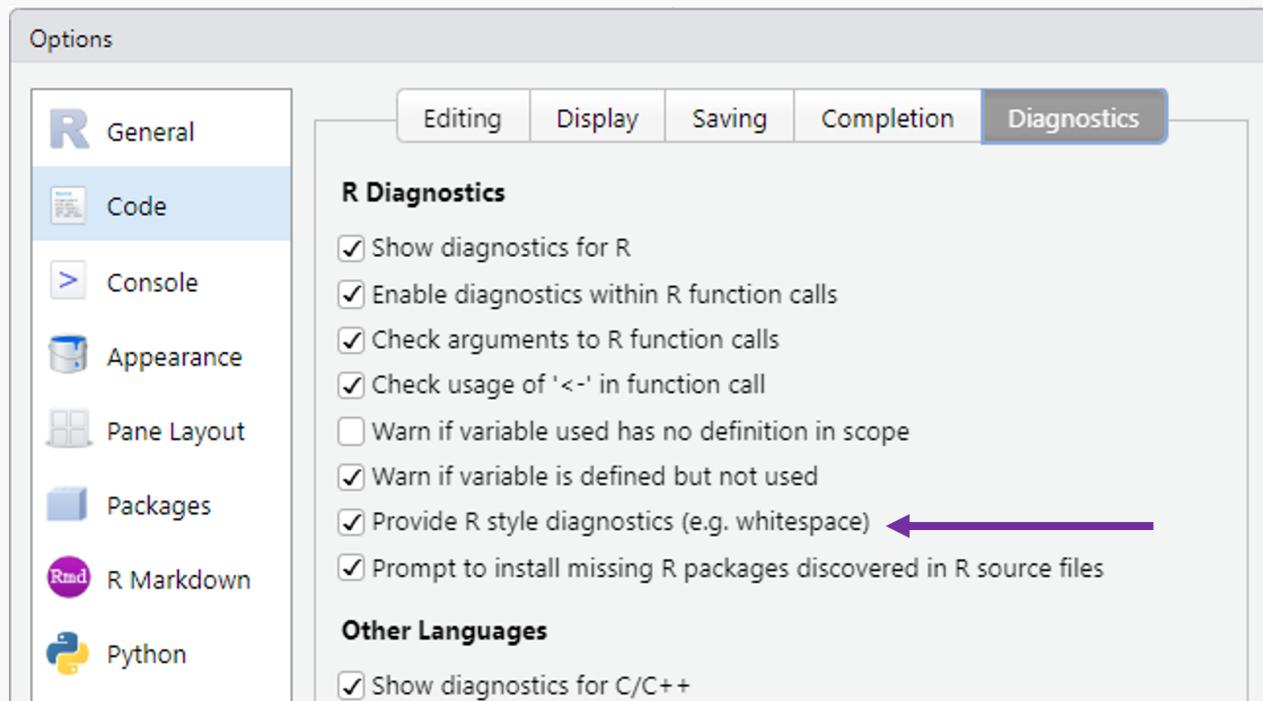
Do I really have to remember all of this?

Luckily, no! R and R Studio provide some nice helpers

Coding style helpers - R Studio

R Studio has style diagnostics that tell you where something is wrong

- Tools -> Global Options -> Code -> Diagnostics



The screenshot shows an R code editor with the following code:

```
10
11 data<-data %>%
12 group_by( group ) %>%
13 summarize(
14   measure=mean(measure,na.rm=TRUE)
15 )
```

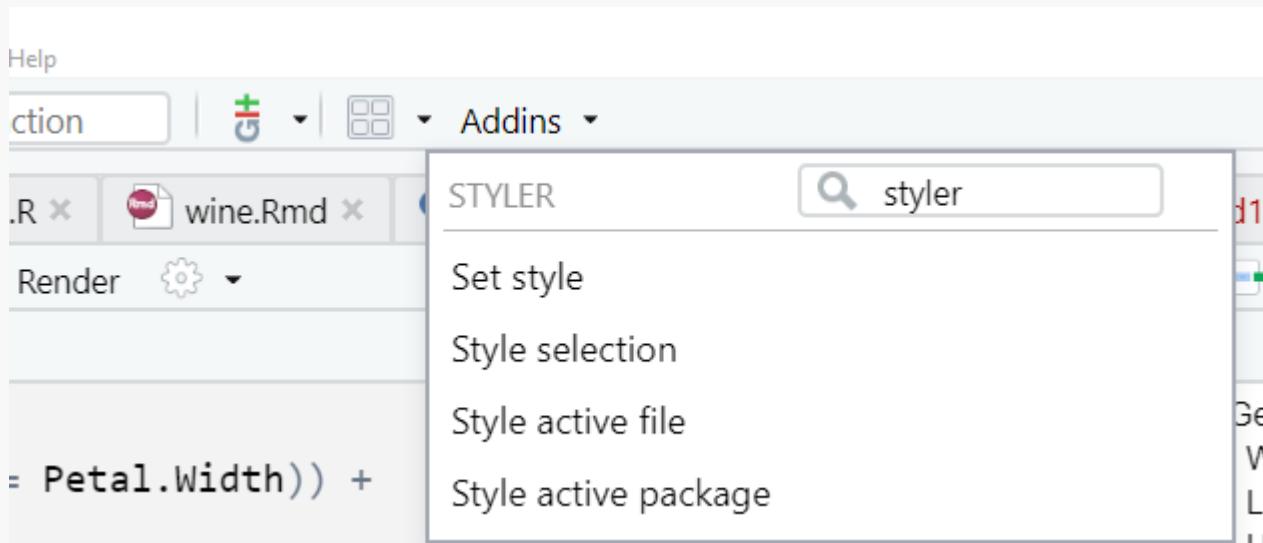
A tooltip appears over the closing parenthesis at line 15, reading "expected whitespace around '=' operator".

Coding style helpers - {styler}

The [styler package](#) package automatically styles your files and projects according to the tidyverse style guide.

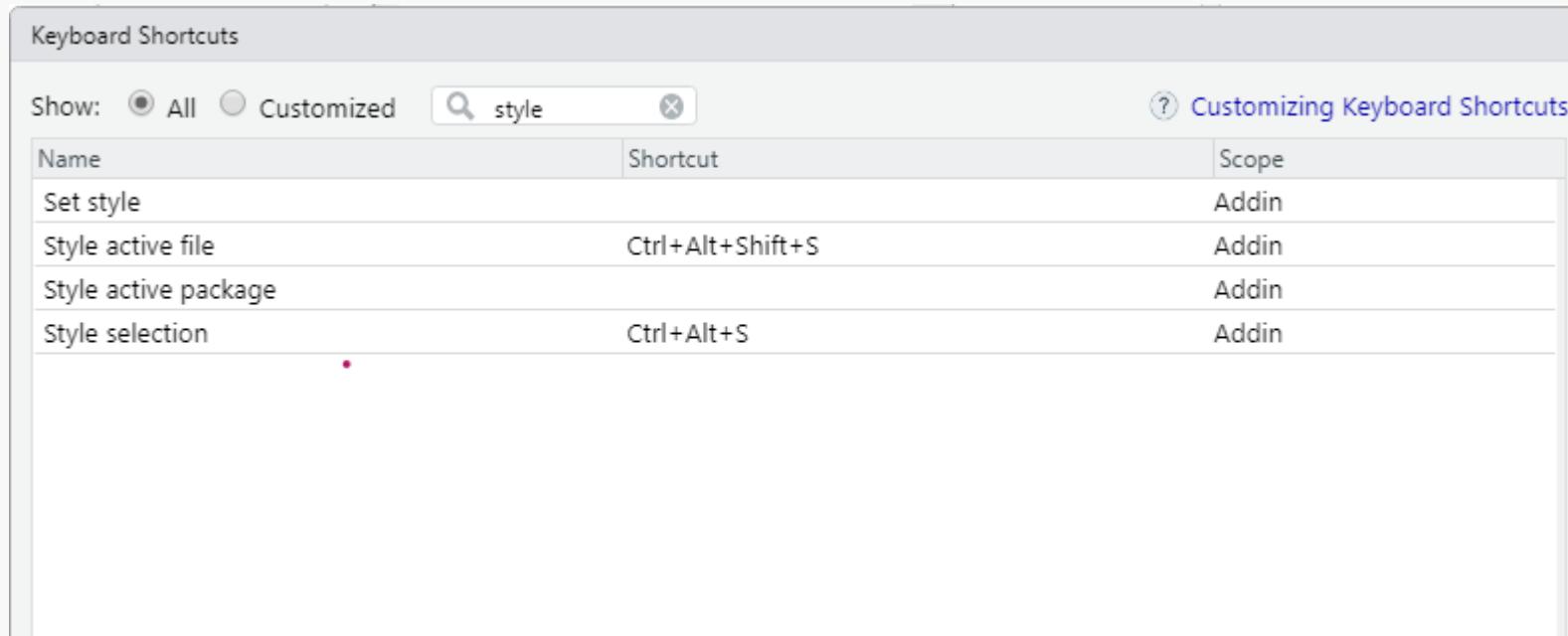
```
# install from CRAN  
install.packages("styler")
```

- Use the R Studio Addins for styler:



Coding style helpers - {styler}

- Pro-Tip: Add a custom keyboard short cut to style your files
 - Tools -> Modify Keyboard Shortcuts



Clean projects and workflows ...

... allow you and others to work productively.



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