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 th
# Baldauf et al. 2022 Journal of Ecolog
# paper.
# Authors: Selina Baldauf and Jane 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

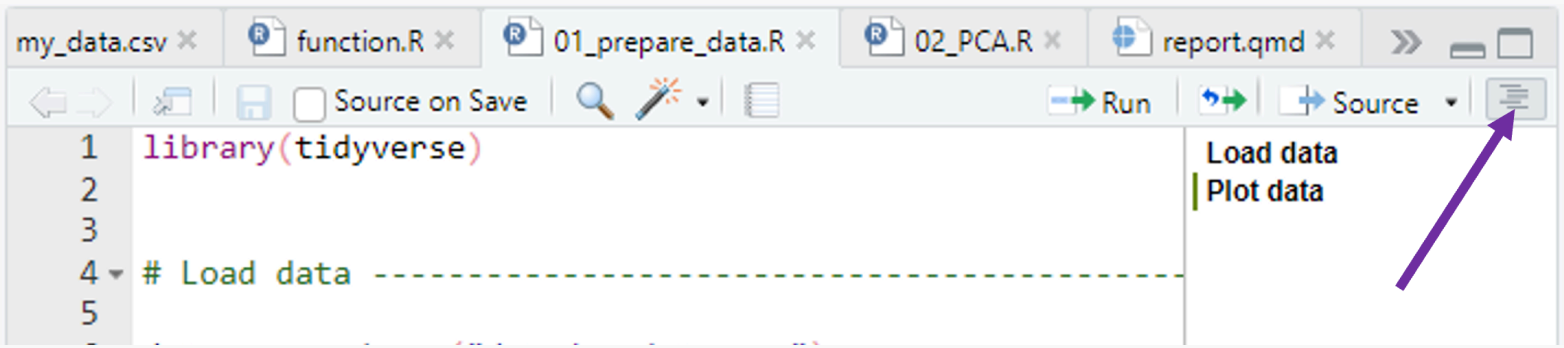
```
# Load data ------------------------------------------------------------

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 + R`
- 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 |>
  summarize_if(is.numeric, mean, .by = Species)  |>
  arrange(desc(Sepal.Length))

# Bad
iris|>summarize_if(is.numeric, mean, .by = Species)|>arrange(desc(Sepal.Length))
```

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 |> summarise(Sepal.Length = mean(Sepal.Length), Sepal.Width = mean(Sepal.Wid

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

Coding style

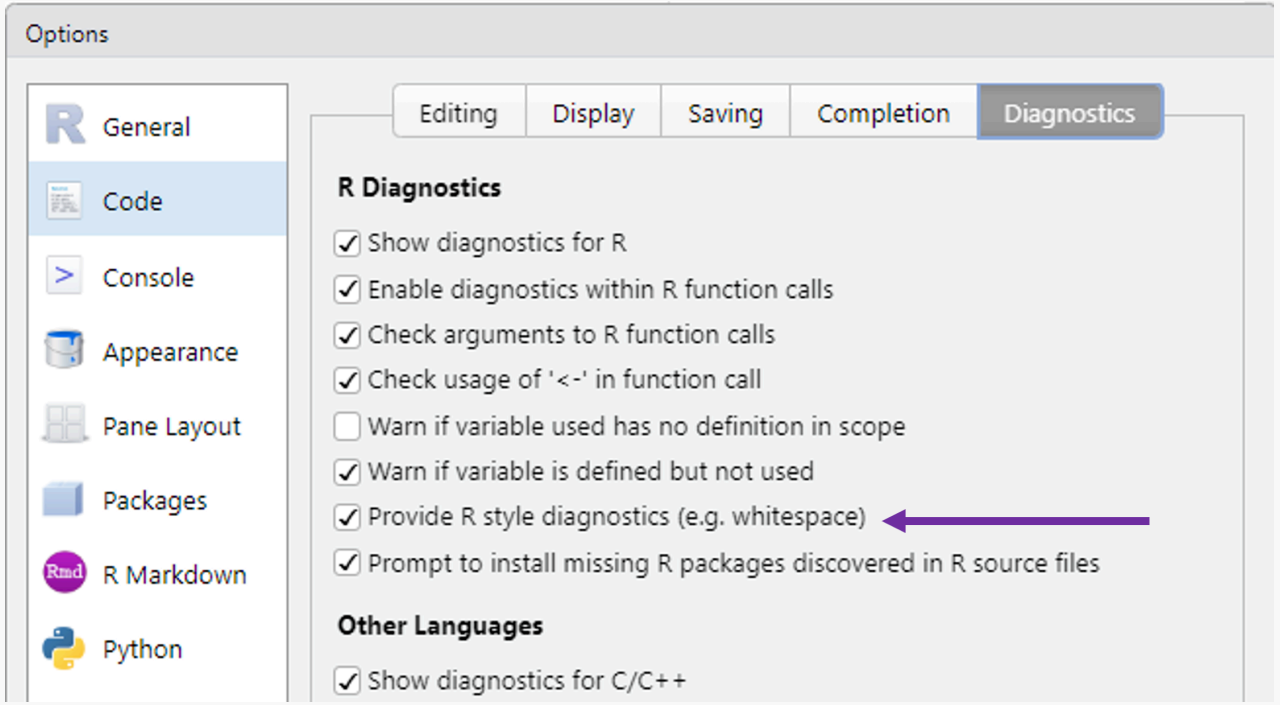
Do I really have to remember all of this?

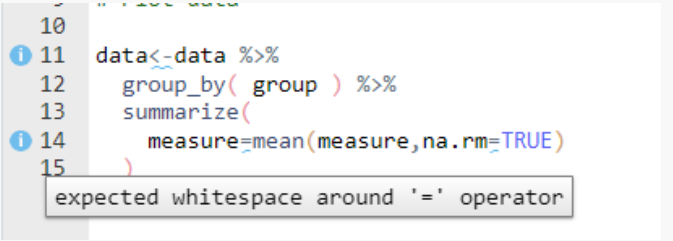
Luckily, no! R and R Studio provide some nice helpers

Coding style helpers - R Studio

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

Tools -> Gloabl Options -> Code -> Diagnostics



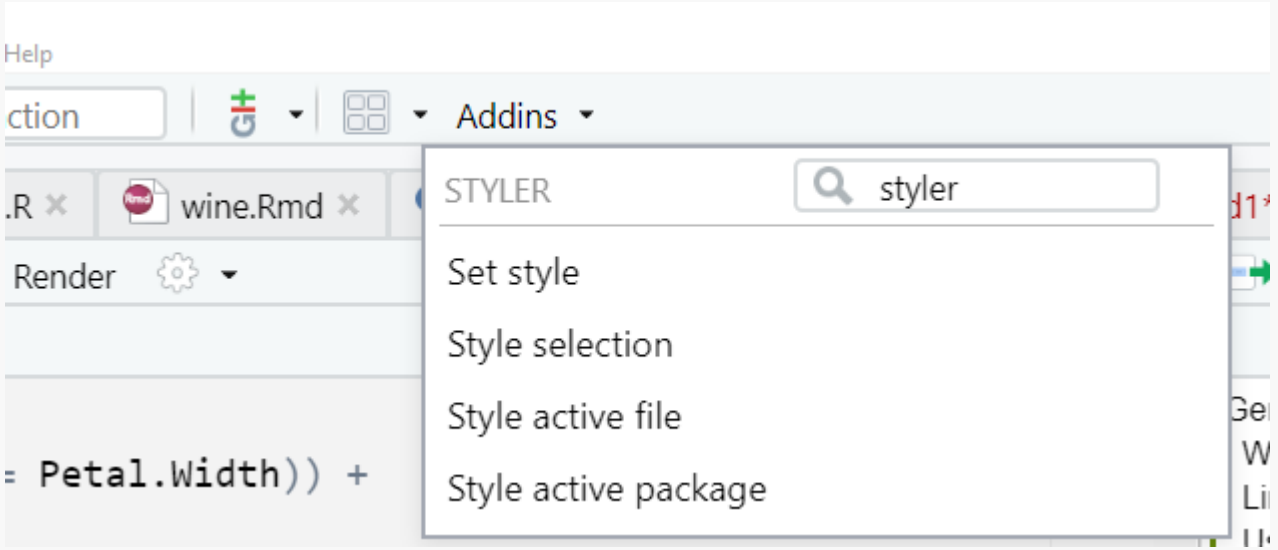


Coding style helpers - {styler}

The styler package package automatically styles your files and projects according to the tidyverse style guide.

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

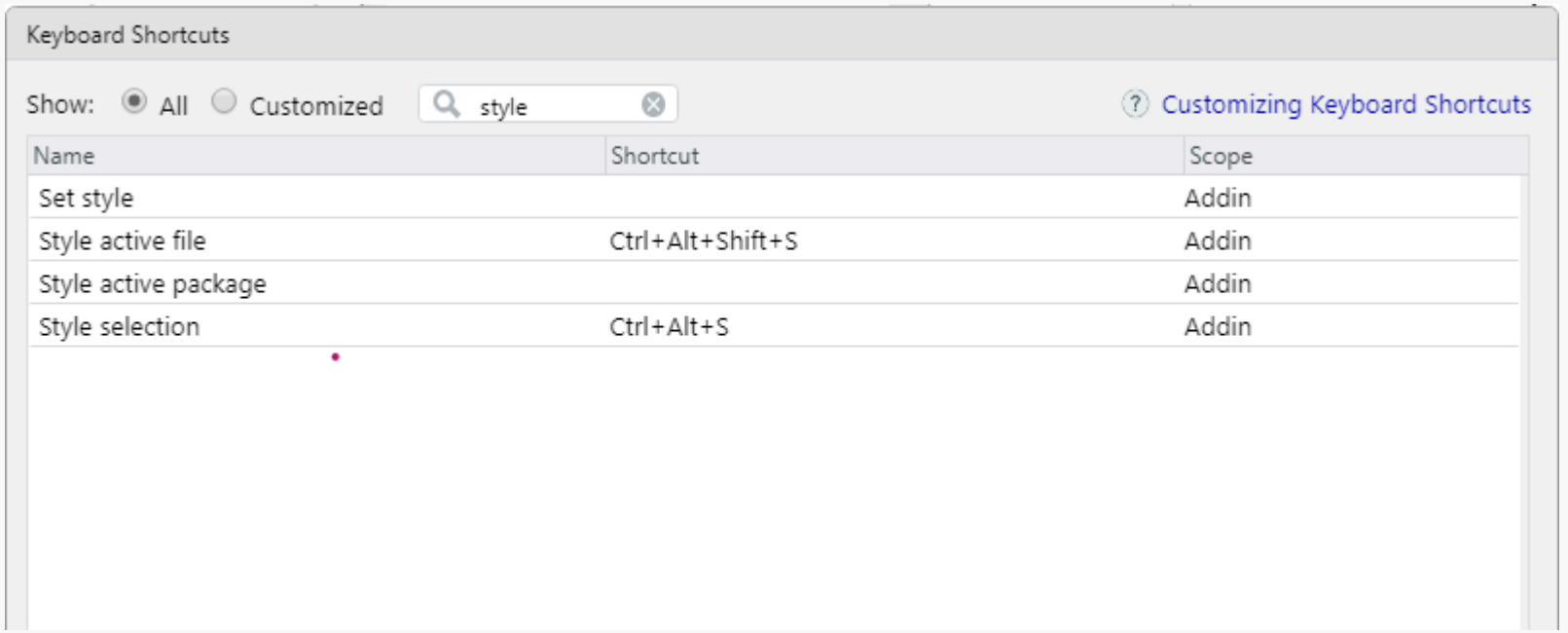
Use the R Studio **Addins** for styler:



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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