

# RMarkdown Basics

# Recap

- Reproducibility across all sciences is a **huge** issue!
- We need to be able to reproduce scientific findings
  - This means the data & code from a given paper must be easy to access and **human readable**
- When it comes to programming in **R**, using **RMarkdown** can help us make sure that other humans can understand our analyses



# Anatomy of RNotebook

The anatomy of all `.Rmd` files (RNotebook or RMarkdown):

- 1. Document Information**

- 2. Formatted Text**

- 3. Code Chunks**

# Anatomy of RNotebook

The anatomy of all `.Rmd` files (RNotebook or RMarkdown):

**1. Document Information**

**2. Formatted Text**

**3. Code Chunks**

# Document Information

- Title
- Subtitle
- Date
- Author
- Output type

```
---  
title: "Making Pretty Code"  
subtitle: "with RMarkdown"  
author: "Shelly Cooper"  
output: html_document  
---
```

This is sometimes called a YAML header.

# Document Information

- Title
- Subtitle
- Date
- Author
- Output type

```
---  
title: "Making Pretty Code"  
author: "Shelly Cooper"  
subtitle: with RMarkdown  
output:  
  pdf_document: default  
  html_document: default  
---
```

**IMPORTANT: Do NOT change any of the tabs/indents in the YAML header. If you copy something from the internet, pay attention to this!**

# Anatomy of RNotebook

The anatomy of all `.Rmd` files (RNotebook or RMarkdown):

**1. Document Information**

**2. Formatted Text**

**3. Code Chunks**

# Formatted Text

You need to tell R how you want your text to be formatted:

- Headers
- Bolded text
- Italicized text
- Hyperlinks
- Bullet/numbered lists



# Headers

The number of # indicates what size and level your header should be.

# Header 1

**Header 1**

## Header 2

**Header 2**

### Header 3

**Header 3**

#### Header 4

**Header 4**

##### Header 5

**Header 5**

# Headers

## # Introduction

Background information goes here.

## # Methods

### ### Participant Demographics

The current study looked at a sample of healthy adults (ages 18-80) across the lifespan.

### ### Statistical Analyses

We first looked at descriptive statistics. Then we ran a multiple regression to look at how three independent variables impacted a dependent variable.

## # Results

### ### Descriptive Results

Go here

### ### Multiple Regression Results

Go here

## # Discussion

Our study was better than yours. This paper has been accepted without needing any revisions!

# Headers

## Introduction

Background information goes here.

## Methods

### Participant Demographics

The current study looked at a sample of healthy adults (ages 18-80) across the lifespan.

### Statistical Analyses

We first looked at descriptive statistics. Then we ran a multiple regression to look at how three independent variables impacted a dependent variable.

## Results

### Descriptive Results

[Go here](#)

### Multiple Regression Results

[Go here](#)

## Discussion

Our study was better than yours. This paper has been accepted without needing any revisions!

# Bold & Italics

## Bold text

- **\*\*bold text \*\***
- **\_\_bold text \_\_** (2 underscores)

## *Italicized text*

- *\* italicized text \**
- *\_ italicized text \_*

To **combine**, pick **\*** for one and **\_** for the other

- **\*\*\_combine\_\*\***
- **\_\_\*\*combine\*\*\_\_**
- **\*\_\_combine\_\_\***
- **\_\_\*combine\*\_\_**

# Hyperlinks

- The word(s) you want to be the link go inside square brackets [ ]
- Immediately after, it's a pair of parentheses ( ) that contains the actual link.

[Google](www.google.com) is my friend!

Google is my friend!

# Bullet Lists - Unordered

- First line must end with a `:` (colon)
- Must have an empty line
- Must have a space after the bullet

## Unformatted

Brazilian States:

- Rio Grande do Sul
- Parana
- Rio de Janeiro

## Formatted

Brazilian States:

- Rio Grande do Sul
- Parana
- Rio de Janeiro

Bullets can be `-` (dashes), `+` (plus), or `*` (asterisk), but all come out looking like what you see here.

# Bullet Lists - Ordered

Same thing, but now with numbers

## Unformatted

Brazilian States:

1. Rio Grande do Sul
2. Parana
3. Rio de Janeiro

## Formatted

Brazilian States:

1. Rio Grande do Sul
2. Parana
3. Rio de Janeiro

# Bullet Lists - Nested

You can have organized, nested lists. Go to the next line, and press **2 spaces**. Then put your new bullet symbol.

- Do NOT press `tab`. For whatever reason, R doesn't like it for Markdown.
- If you still are stuck, try 4 spaces -- that should work

## Unformatted

Brazilian States & Capitals:

1. Rio Grande do Sul
  - \* Porto Alegre
    - This is the best!
2. Parana
  - \* Curitiba
3. Rio de Janeiro
  - \* Rio de Janeiro

## Formatted

Brazilian States & Capitals:

1. Rio Grande do Sul
  - Porto Alegre
    - This is the best!
2. Parana
  - Curitiba
3. Rio de Janeiro
  - Rio de Janeiro



# Anatomy of RNotebook

The anatomy of all `.Rmd` files (RNotebook or RMarkdown):

**1. Document Information**

**2. Formatted Text**

**3. Code Chunks**

# Code Chunks

- This is what makes RMarkdown so cool!
- Type your code directly into a code chunk and work with it just like you would a `.R` script file
- When you're done, click `knit` at the top to generate your pretty report
  - All code chunks will be executed (unless you say otherwise...see next lecture)

# Code Chunks

```
```{r}  
# code goes here  
answer <- 1 + 2  
```
```

Each code chunk:

- **Starts and ends** with three backticks
  - if you don't have the ending 3, you're gonna have a bad time
- Has `{r}` at top next to the first 3 backticks
- Has gray background
- Looks like normal code
- Runs like normal code

# Making Code Chunks

To make a code chunk:

- Use the `insert` button
- Manually type the backticks & `{r}`
- Keyboard shortcuts
  - PCs: `ctrl + alt + i`
  - Macs: `cmd + opt + i`



# A finished product

## # Step 1: Data Preparation

Let's first get our data ready for an analysis

```
```{r}
# load the packages
library(knitr)
library(psych)
library(ggplot2)

# set the working directory
setwd("~/Desktop/rSkillLab/")

# import data
midus <- read.csv("midus.csv")
```
```

## # Step 2: Analysis

Now let's get the mean of the age variable.

```
```{r}
mean_age <- mean(midus$age, na.rm = TRUE)
```
```

## Step 1: Data Preparation

Let's first get our data ready for an analysis

```
# load the packages
library(knitr)
library(psych)
library(ggplot2)
```

```
##
## Attaching package: 'ggplot2'
```

```
## The following objects are masked from 'package:psych':
##
##      %+%, alpha
```

```
# set the working directory
setwd("~/Desktop/rSkillLab/")

# import data
midus <- read.csv("midus.csv")
```

## Step 2: Analysis

Now let's get the mean of the age variable.

```
mean_age <- mean(midus$age, na.rm = TRUE)
```

# Code Chunks

All code will run in a code chunk

- It's very literal!
- We can't see `midus` or `mean_age`
  - These are stored as objects
  - If you want to see them, you need to tell R to show them to you
- We needed to import `midus`
  - If it was in your Environment *before* knitting the file AND you did *not* import your data, it would fail
  - Whatever data you use, you need to import it!

# Viewing data.frames

To help make data.frames readable for humans, use the `kable()` function

- comes from the `knitr` package, although surprisingly, you don't need to manually load this one

# 1. Data Preparation

Let's first get our data ready for an analysis

```
# load the packages
library(knitr)
library(psych)
library(ggplot2)

# set working directory
setwd("~/Box Sync/Brazil 2019/")

# import data
midus <- read.csv("midus.csv")

# view the first 6 rows of the midus dataset
# head(midus) gets the first 6 rows
# kable() makes the output pretty
kable(x = head(midus), caption = "Midus Dataset")
```

Midus Dataset

| ID    | sex    | age | BMI    | physical_health_self | mental_health_self | self_esteem | life_satisfaction | hostility | heart_self | heart_father |
|-------|--------|-----|--------|----------------------|--------------------|-------------|-------------------|-----------|------------|--------------|
| 10001 | Male   | 61  | 26.263 | 2                    | 4                  | 42          | 7.750             | 5.5       | No         | No           |
| 10002 | Male   | 69  | 24.077 | 5                    | 5                  | 34          | 8.250             | 6.0       | No         | Yes          |
| 10005 | Female | 80  | NA     | 4                    | 4                  | 49          | 9.333             | 4.0       | No         | No           |
| 10006 | Female | 60  | NA     | 3                    | 3                  | NA          | NA                | NA        | No         | Yes          |
| 10010 | Male   | 55  | NA     | 4                    | 3                  | 28          | 8.250             | 8.0       | No         | Yes          |
| 10011 | Female | 52  | 25.991 | 5                    | 4                  | 41          | 7.000             | 5.5       | No         | No           |



# Next up

Changing parameters in the YAML header and in code chunks to make the output just right.

