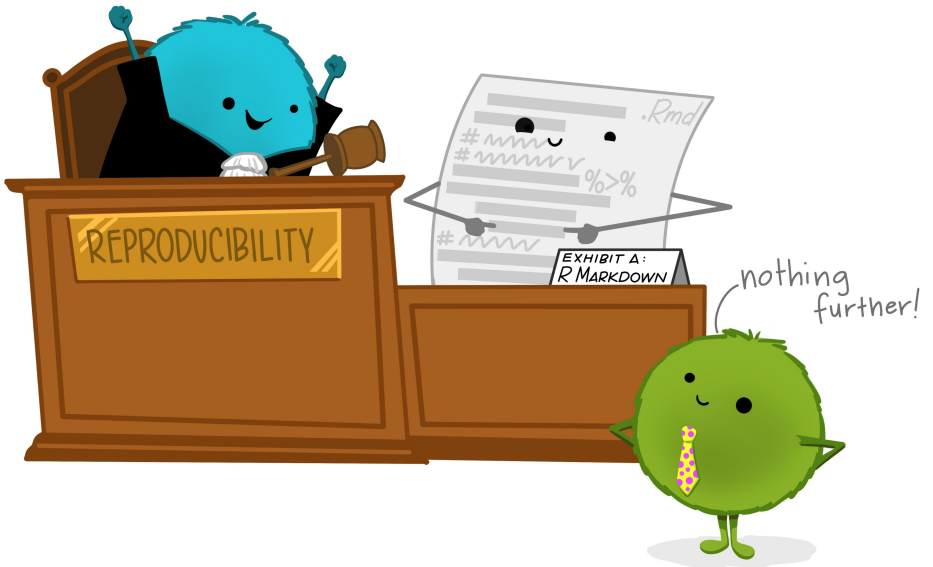
RMarkdown Basics

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



Artwork by Allison Horst

Anatomy of RNotebook

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

1. **Document Information**
2. **Formatted Text**
3. **Code Chunks**

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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

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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](www.google.com) 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
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    - Rio de Janeiro

Anatomy of RNotebook

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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
```
```

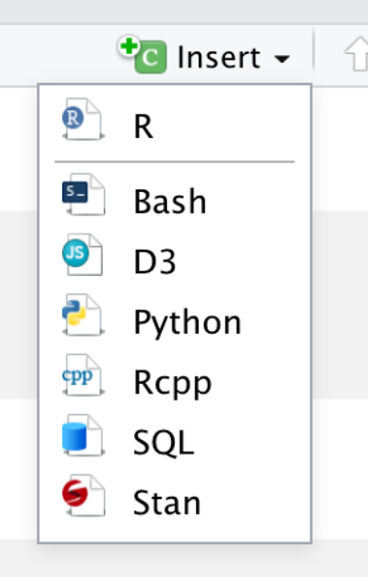
Each code chunk:

- **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

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

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

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

```r
# 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)
```

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

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