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Today's topics

- Pregistration and registered reports
  - What, why, who, how?
- Introduction to RStudio
- Introduction to R Markdown

Registered reports

- What are they?
- Why are they a thing?
- Who's doing them?
- How they work and how to get involved

What are they?

- Peer review and provisional acceptance of methodologically sound study proposals

Why registered reports?

- Results (positive or null) don't determine publication (prevent publication bias)
- Reduce questionable practices
  - p-hacking
  - HARKing

Why not registered reports

- Restrict creativity in reporting "un-registered"/exploratory analyses?
  - Clearer communication about confirmatory vs. exploratory
- Mandatory vs. optional
- Clinical trials vs. fundamental research
- Exploration is not a dirty word

Who's doing them?

- Journals with Registered Reports from COS

- *Cognition & Emotion*
- *Cortex*
- *Nature Human Behavior*

How do they work

- Google sheet comparing features https://docs.google.com/spreadsheets/d/1D4_k-8C_UENTRtbPzXfhjEyu3BfLxdOsn9j
  edit#gid=0

Preregistration separate from publication

Center for Open Science (COS) Preregistration Challenge

- 1,000 $1K awards, July 1, 2017 (100), January 1, 2018 (100), July 1, 2018 (250), December 31, 2018 (500)
- Preregister hypothesis, sampling, analysis plans with OSF

AsPredicted.org

- Standardized preregistration tool
- Separate confirmatory from exploratory analyses
- One author completes checklist, others receive email to approve
- Unique (private) URL to pdf
- Share when you like or never

Your thoughts on preregistration, registered reports?

Tools for reproducible workflows

RStudio

- An integrated development environment (IDE) for R

Components of RStudio

- Code editor
- R console
- Integrated help
- Image viewer
- Integration with git and other version-control packages
- Project management

RStudio in the cloud

- RStudio can be run in a browser from a server running RStudio Server
- Demo
  - Running this under Amazon Web Services (AWS) free tier
- Instructions for doing this yourself can be found here

R Markdown

- Markdown
  - Mark-up language to make it easy to write HTML
- R Markdown special type of Markdown
  - Allows for "literate" programming, mixing text, analysis, figures
  - Adds to Markdown syntax

Markdown syntax

- Text formatting
  - *italics* by surrounding text with single asterisks or underscores: `*italics*` or `_italics_`
  - **boldface** by surrounding text with double asterisks or underscores: `**boldface**` or `__boldface__`
  - ~~strikethrough~~ by surrounding text with double tildes: `~~strikethrough~~`
  - Clickable URLs by surrounding link text with square brackets and URL with parentheses: `[Clickable URLs](http://www.psu.edu)`

Markdown syntax

- Paragraph formatting
  - Headings with level specified by the number of hash (#) marks
  - Lists (bullet and enumerated)
  - Block quotes
  - Code blocks

```
# This is a Heading 1
## This is a Heading 2
### This is a Heading 3
```

- An item
  - A nested item
    - A doubly-nested item
- Another item

Code:

```
- An item
    - A nested item
        - A doubly-nested item
- Another item
```

---

1. An enumerated item
   - A nested item
2. A second enumerated item

Code:

```
1. An enumerated item
    - A nested item
1. A second enumerated item
```

Notice how the numbers are incremented automatically!

> Four score and seven years ago, some famous President spoke infamous words that would live on throughout history. These words are famous enough that I want to highlight them with a block quote.

```
> Four score and seven years ago, some famous President
> spoke infamous words that would live on throughout history.
> These words are famous enough that I want to highlight them with a block quote.
```

More on Markdown syntax

- Images can be inserted using this syntax `![Alt text](/path/to/img.jpg)`
- Comments – won't print in rendered output – `<!- This is a comment ->`

R Markdown additions

- .Rmd extension
- Combine text, code, images, figures, video
- "Computable" reports, documents, slide shows, notebooks
- Output in multiple formats from the same file

Make some data

```
x = rnorm(n = 100, mean = 0, sd = 1)   # N(0,1)
y = rnorm(n = 100, mean = 2, sd = 0.5) # N(2, 0.5)
```

Summary of x, y

```
summary(x)
```

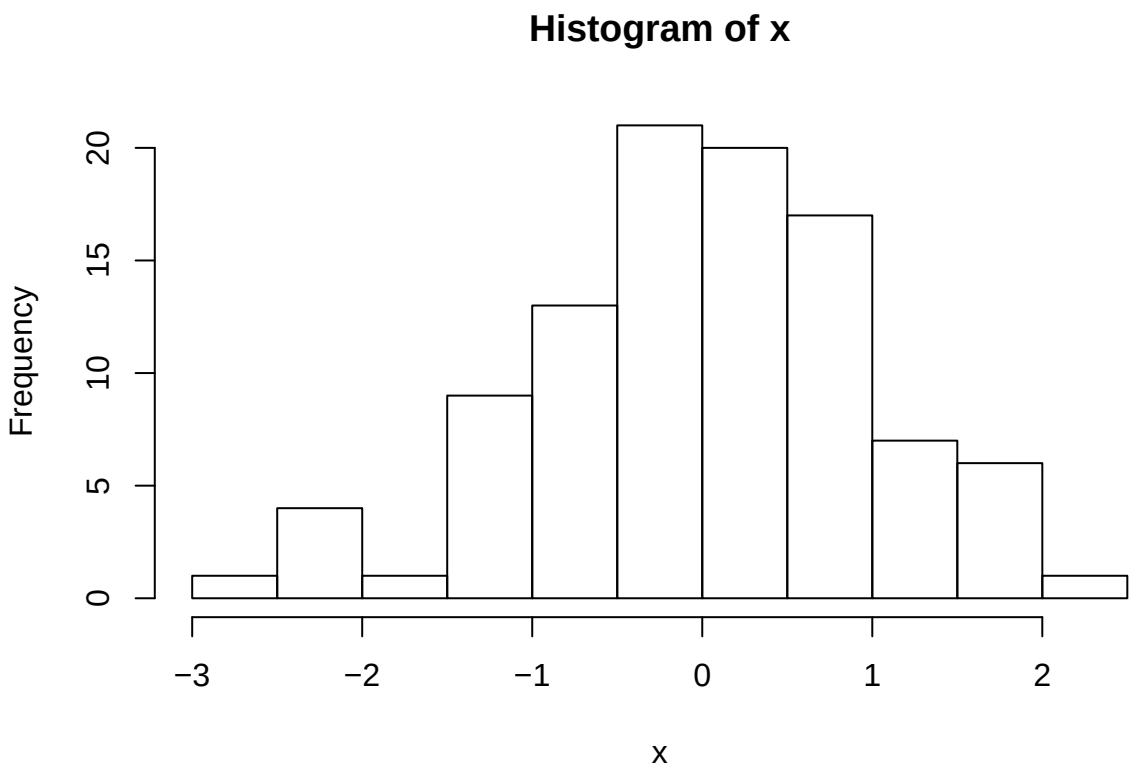
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -2.675000 -0.661600  0.036360 -0.007298  0.687200  2.309000
```

```
summary(y)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.7634  1.5760  1.9920  1.9720  2.2870  3.0430
```

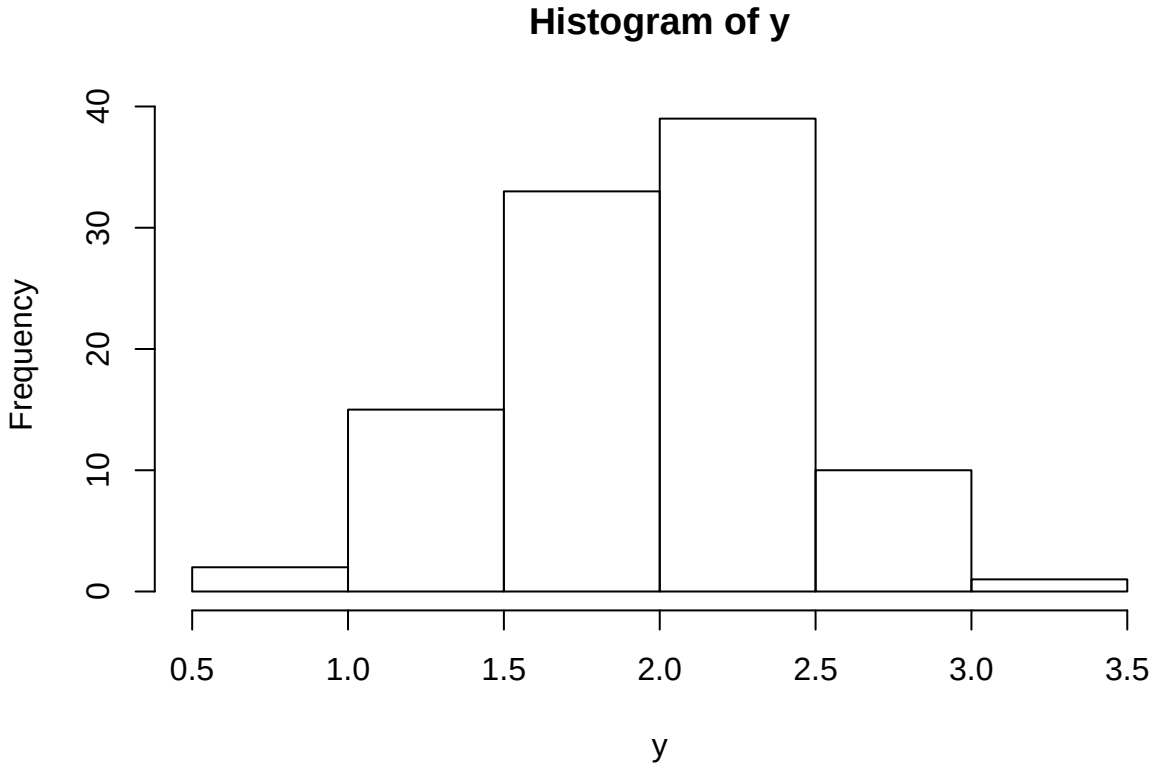
Histogram of x

```
hist(x)
```



Histogram of y

```
hist(y)
```



Embed figure saved locally using HTML

```
<img src="../img/my-img.jpg" height=500px>
```

Height parameter (or, e.g. `width=800px`) is optional, but useful. Remember Markdown -> HTML.

Embed figure from the web

```
<img src="http://cdn.abclocal.go.com/content/wpvi/images/cms/280434_1280x720.jpg" width=900px>
```

Embed YouTube video

```
<iframe width="420" height="315" src="https://www.youtube.com/embed/9hUy9ePyo6Q" frameborder="0"
allowfullscreen></iframe>
```

- YouTube gives you code to cut and paste.

Printing computed variables

```
summ.x = summary(x)
summ.y = summary(y)
names(summ.x) # Figure out variable names for indexing
```

```
## [1] "Min."    "1st Qu." "Median"  "Mean"    "3rd Qu." "Max."
```

Index by variable name: X lies within the range of [-2.675, 2.309].

Index by numeric index: The (y-x) difference in means is `1.979298`.

Calculate and report: The correlation between x and y is 0.154001.

Questions?