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Today's topics

- Preregistration 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

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

How do they work

- Google sheet comparing features https://docs.google.com/spreadsheets/d/1D4_k-8C_UENTRtbPzXfhjEyu3BfLxdOsn9jedit#gid=0
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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.
## -2.45900 -0.62950 -0.03911 -0.02360  0.61900  2.04700
```

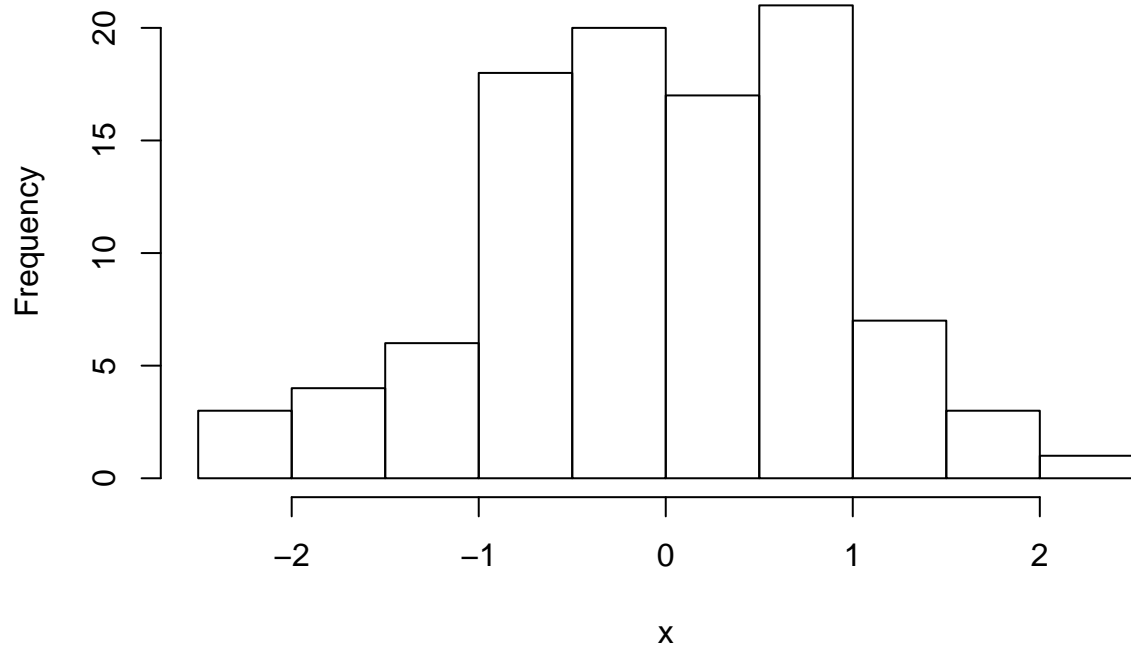
```
summary(y)
```

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
##  0.7328  1.5640  1.8560  1.8730  2.2150  2.9150
```

Histogram of x

```
hist(x)
```

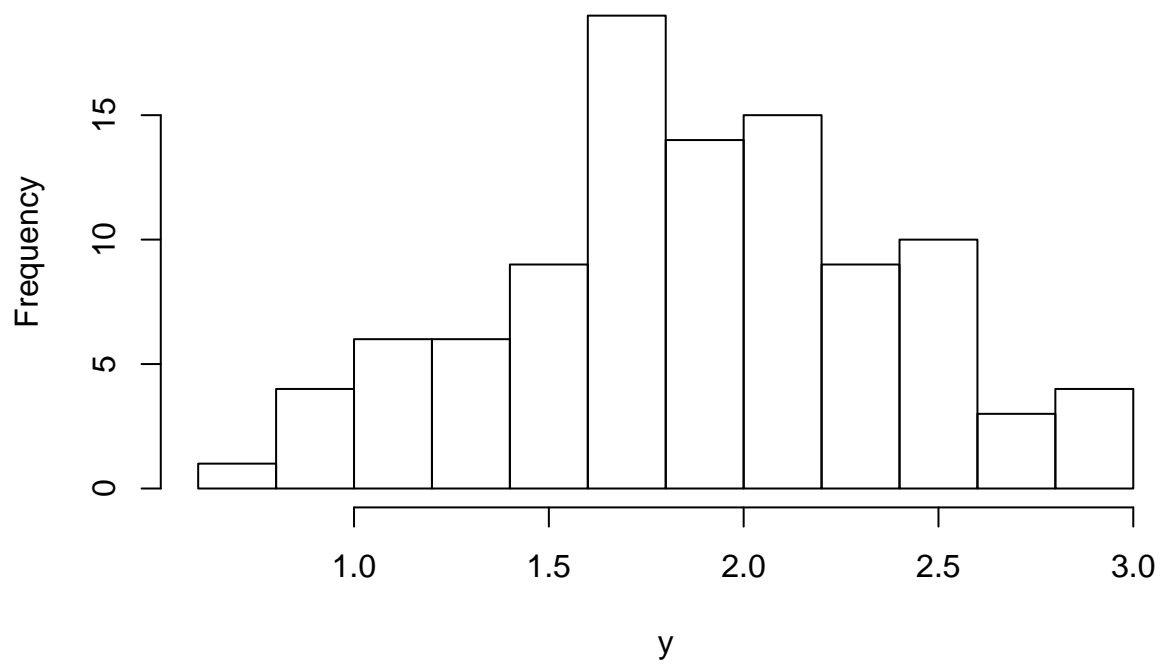
Histogram of x



Histogram of y

```
hist(y)
```

Histogram of y



Embed figure saved locally using HTML

```

```

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

Embed figure from the web

```

```

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.
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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 [-2.459, 2.047].

Index by numeric index: The (y-x) difference in means is 1.8966.

Calculate and report: The correlation between x and y is 0.0545461.

Questions?