

Friends don't let friends copy-paste

Computationally  
reproducible APA-  
style manuscripts  
with the R package  
papaja



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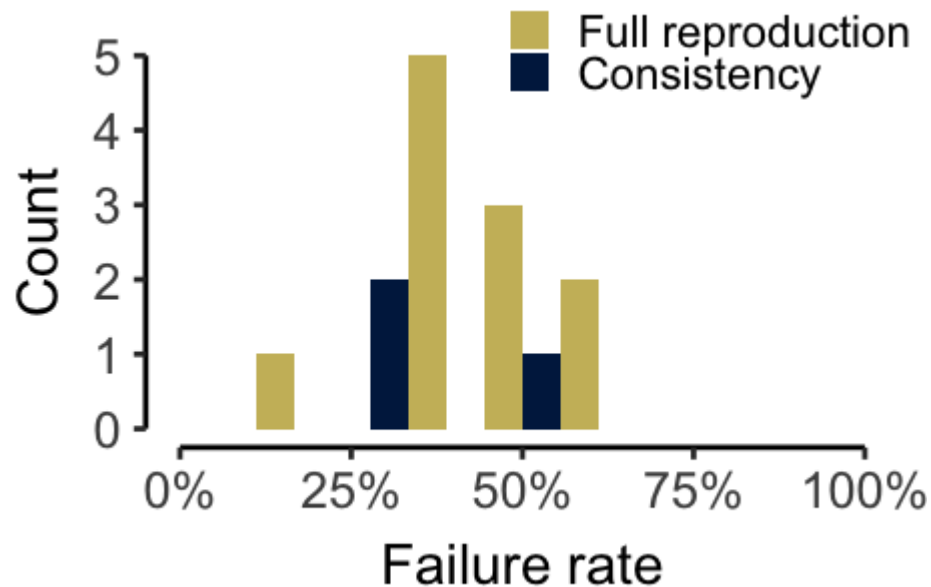
# Agenda

- Computational reproducibility
- Dynamic documents with **papaja**
  - Manuscripts
    - Writing
    - Reporting results
  - Revision letters

Computational reproducibility

# Computational reproducibility

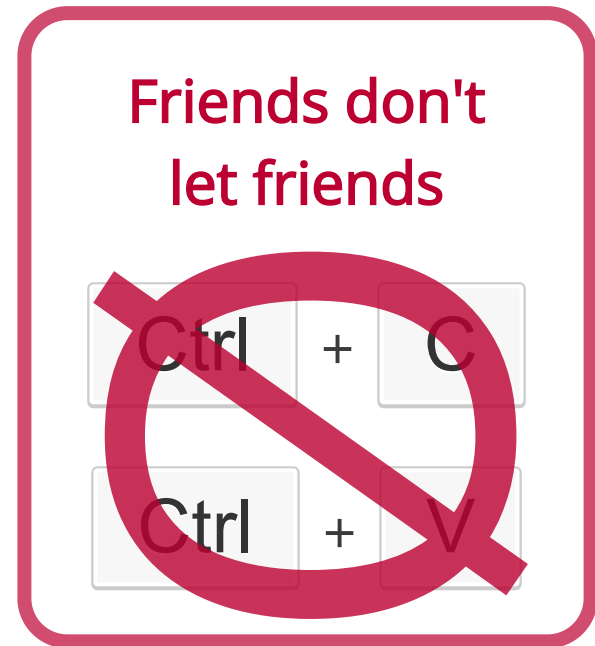
a minimum necessary condition for a finding to be believable and informative (p. 4, Cacioppo, Kaplan, Krosnick, Olds, & Dean, 2015)



# Computational reproducibility

## Common causes

- Typos
- Copy-paste errors
- Incorrect rounding
- "Outdated" results



(Artner et al., 2020; Eubank, 2016)

# Computational reproducibility

## Common causes

- File paths
- Incomplete data
- Incomplete scripts
- Outdated libraries

(Eubank, 2016; Konkol, Kray & Pfeiffer, 2019)

# Computational reproducibility

## Towards a reproducible pipeline

- Packaged environments (e.g., Docker)
- Open source software (e.g., R)
- Change and provenance tracking (e.g., Git)
- Pipeline tools (e.g., Make, targets)
- Dynamic documents (e.g., R Markdown, Quarto)



# Dynamic documents with papaja

# papaja

## Preparing APA Journal Articles

1. PDF and DOCX templates for manuscripts
2. Functions to report results, e.g.
  - Statistics in text
  - Tables
  - Figures
3. PDF template for revision letters

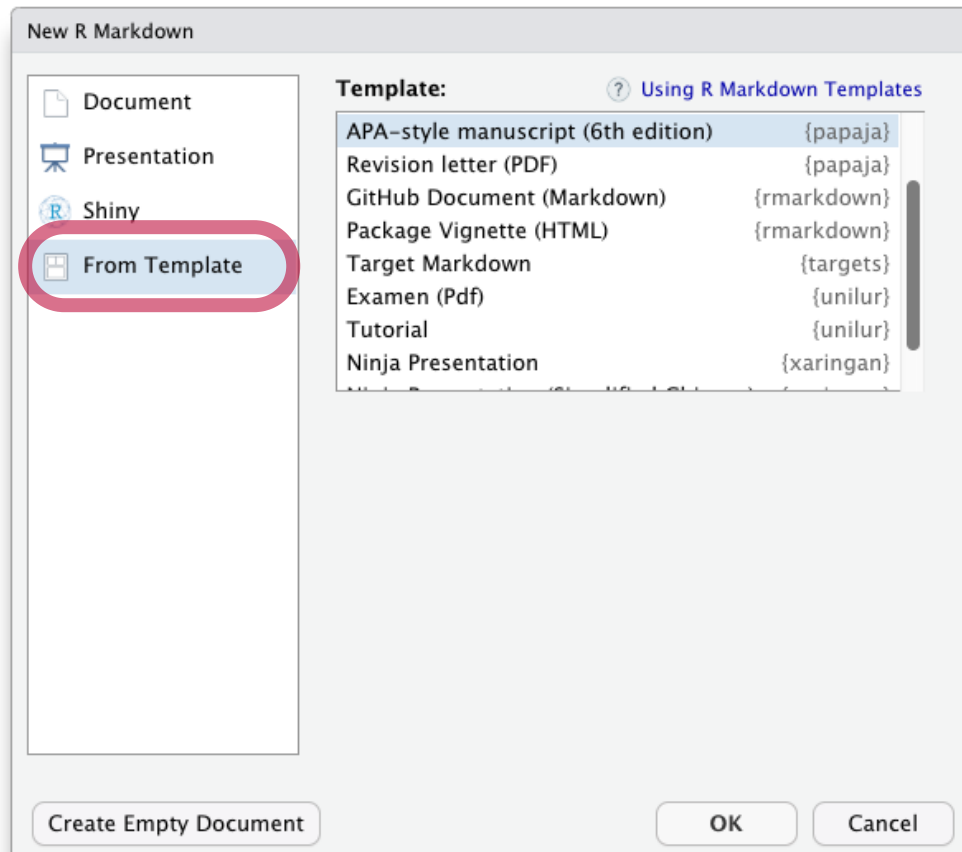
# papaja



Allison Horst (CC-BY-4.0)

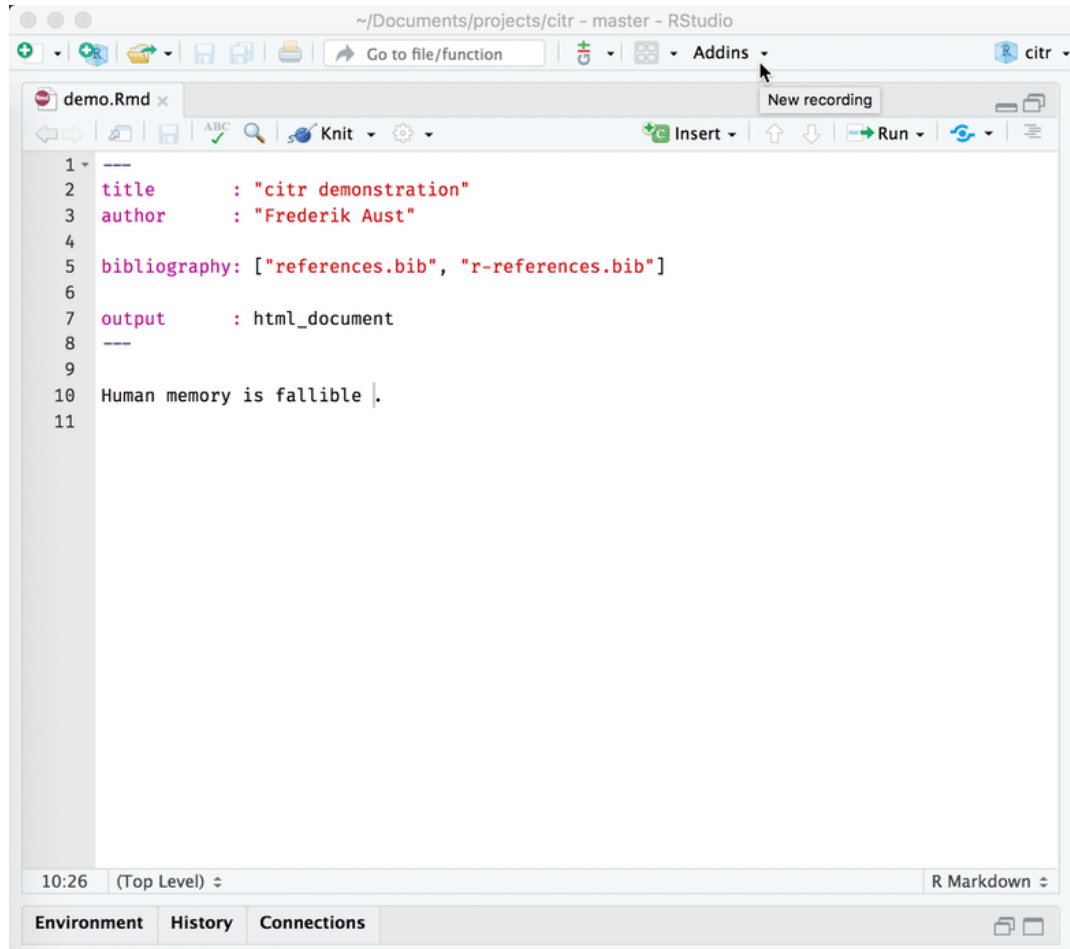
Manuscripts

# papaja



# A quick demonstration

# papaja



The screenshot shows the RStudio IDE interface. The title bar indicates the project path: `~/Documents/projects/citr - master - RStudio`. The top toolbar includes icons for file operations and a search bar labeled "Go to file/function". The "Addins" menu is open, showing a "New recording" button. The main editor window displays a file named `demo.Rmd` with the following content:

```
1 ---
2 title      : "citr demonstration"
3 author     : "Frederik Aust"
4
5 bibliography: ["references.bib", "r-references.bib"]
6
7 output     : html_document
8 ---
9
10 Human memory is fallible |
11
```

The status bar at the bottom shows the time `10:26`, the current level `(Top Level)`, and the document type `R Markdown`. The bottom panel contains tabs for "Environment", "History", and "Connections".

# Reporting results

```
cor_res <- with(cosmetic_surgery, cor.test(Post_QoL, BDI))  
cor_res
```

```
##  
##      Pearson's product-moment correlation  
##  
## data:  Post_QoL and BDI  
## t = 7.7581, df = 274, p-value = 1.71e-13  
## alternative hypothesis: true correlation is not equal to 0  
## 95 percent confidence interval:  
##  0.3224754 0.5165716  
## sample estimates:  
##      cor  
## 0.4243863
```



# Reporting results

`apa_print()` facilitates reporting of results

```
cor_res_apa <- apa_print(cor_res)
head(cor_res_apa, 3)
```

```
## $estimate
## [1] "$r = .42$, 95\\% CI $[.32, .52]$"
##
## $statistic
## [1] "$t(274) = 7.76$, $p < .001$"
##
## $full_result
## [1] "$r = .42$, 95\\% CI $[.32, .52]$, $t(274) = 7.76$,
```

# Reporting results

`apa_print()` facilitates reporting of results

```
## $table
## A data.frame with 5 labelled columns:
##
##      estimate    conf.int statistic   df p.value
## 1          .42 [.32, .52]      7.76 274    < .001
##
## estimate : $r$
## conf.int : 95\\% CI
## statistic: $t$
## df       : $\\mathit{df}$
## p.value  : $p$
```

# Reporting results

```
```{r}
cor_res <- with(cosmetic_surgery, cor.test(Post_QoL, BDI))
cor_res_apa <- apa_print(cor_res)
```
```

Post-operation quality of life was correlated with depression severity, `r cor\_res\_apa\$full\_result`.

Post-operation quality of life was correlated with depression severity,  $r = .42$ , 95\% CI  $[.32, .52]$ ,  $t(274) = 7.76$ ,  $p < .001$ .

# Reporting results

## Multiple parameters

```
lm_res <- lm(Post_QoL ~ Base_QoL + BDI, data = cosmetic_surveys)

lm_res_apa <- apa_print(lm_res)
head(lm_res_apa$estimate, 3)
```

```
## $Intercept
## [1] "$b = 18.50$, 95\\% CI $[13.10, 23.91]$"
##
## $Base_QoL
## [1] "$b = 0.59$, 95\\% CI $[0.50, 0.67]$"
##
## $BDI
## [1] "$b = 0.17$, 95\\% CI $[0.11, 0.22]$"
##
```

# Reporting results

## Multiple parameters

```
```{r}
lm_res <- lm(Post_QoL ~ Base_QoL + BDI, data = cosmetic_su
lm_res_apa <- apa_print(lm_res)
```
```

Depression severity was associated with post-operation quality of life, `r lm\_res\_apa\$statistic\$BDI`.

Depression severity was associated with post-operation quality of life,  $t(273) = 6.08$ ,  $p < .001$ .

# Reporting results

## Model fit

```
lm_res_apa$estimate["modelfit"]
```

```
## $modelfit  
## $modelfit$r2  
## [1] "$R^2 = .50$, 90\\% CI $[0.42, 0.57]$"   
##  
## $modelfit$r2_adj  
## [1] "$R^2_{adj} = .50$"   
##  
## $modelfit$aic  
## [1] "$\\mathrm{AIC} = 1,829.53$"   
##  
## $modelfit$bic  
## [1] "$\\mathrm{BIC} = 1,844.02$" 
```

# Reporting results

| A-B              | D-L     | L-S               | S-Z              |
|------------------|---------|-------------------|------------------|
| afex_aov         | default | lsmobj            | summary.aovlist  |
| anova            | emmGrid | manova            | summary.glht     |
| anova.lme        | glht    | merMod            | summary.glm      |
| Anova.mlm        | glm     | mixed             | summary.lm       |
| aov              | htest   | papaja_wsci       | summary.manova   |
| aovlist          | list    | summary_emm       | summary.ref.grid |
| BFBayesFactor    | lm      | summary.Anova.mlm |                  |
| BFBayesFactorTop | lme     | summary.aov       |                  |

# papaja

## Tables and figures

`apa_table()` renders tables with variable labels

```
cap <- "Cosmetic surgery"

apa_table(
  lm_res_apa$table,
  caption = cap
)
```

Table 1. *Cosmetic surgery*

| Predictor | <i>b</i> | 95%CI          | <i>t</i> (273) | <i>p</i> |
|-----------|----------|----------------|----------------|----------|
| Intercept | 18.50    | [13.10, 23.91] | 6.74           | < .001   |
| Base QoL  | 0.59     | [0.50, 0.67]   | 13.23          | < .001   |
| BDI       | 0.17     | [0.11, 0.22]   | 6.08           | < .001   |



# A quick demonstration

# papaja

## Tables and figures

### Cross-referencing

```
```${r}  
#| label: volcano-plot  
#| fig.cap: "This is a caption."  
  
ggeffects::ggpredcict(lm_res, terms = ~ BDI) |>  
  plot() +  
  theme_apa()  
```
```

The predictons are shown in  
Figure\ \@ref(fig:volcano-plot).

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## R package citations

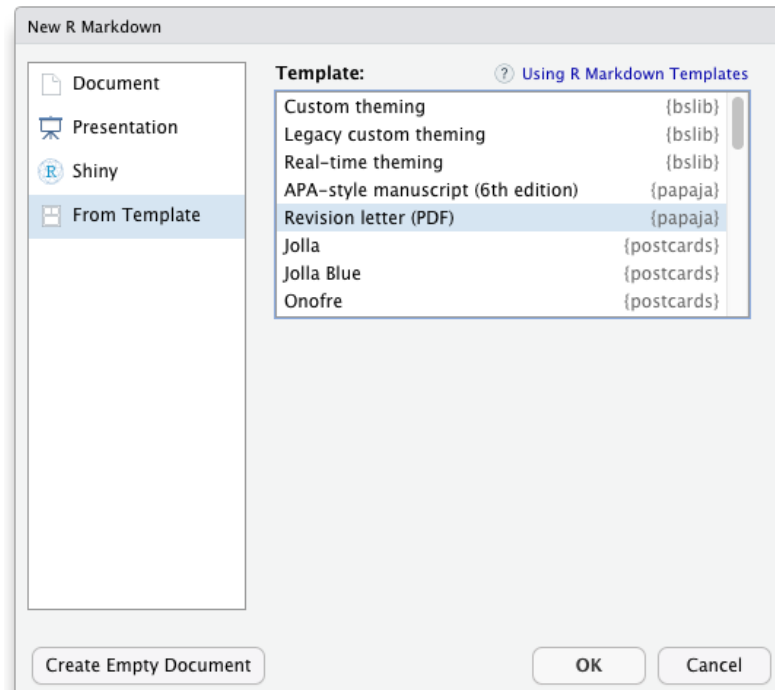
```
` `{r}  
my_citations <- cite_r(file = "r-references.bib")  
` `
```

We used `r my\_citations` for all analyses.

We used R (Version 4.1.2; R Core Team, 2021) and the R-package papaja (Version 0.1.1; Aust & Barth, 2022) for all analyses.

Revision letters

# Revision letter template



# Revision letter template

`:::reviewer` and `:::` mark reviewer comments

## **# Reviewer \#1**

```
:::reviewer
This is a reviewer comment
:::

This is our response
```

### **1. Reviewer #1**

**[RC 1.1.] This is a reviewer comment**  
This is our response

# Revision letter template

"Labelled quotes"-tags to quote paragraphs from the revised manuscript `manuscript.Rmd`

```
quote_labels: yes
```

```
<@~{#revised-paragraph}
```

This paragraph was revised to please Reviewer 2.

```
~@>
```

# Revision letter template

"Labelled quotes"-tags to quote paragraphs from the revised manuscript `manuscript.Rmd`

In revision letter

```
```${r}  
quote_from_tex(  
  x = "revised-paragraph",  
  file = "manuscript.tex"  
)  
```
```



# Revision letter template

Use `latexdiff` ([latexdiff](#), [online](#)) to automatically highlight changes between two LaTeX files

```
latexdiff manuscript_original.tex revision.tex > diff.tex
```

```
\DIFdelbegin \DIFdel{This }\DIFdelend  
\DIFaddbegin \DIFadd{In stable environments, this }  
\DIFaddend ability is fundamental for \DIFdelbegin  
\DIFdel{human beings as }\DIFdelend \DIFaddbegin \DIFadd  
{because }\DIFaddend it allows us to \DIFdelbegin \DIFdel  
{act optimally in stable environments }\DIFdelend  
\DIFaddbegin \DIFadd{perform optimally }\DIFaddend with  
relatively little effort.
```

# Revision letter template

Highlighted changes can be quoted in the revision letter

```
% <@~{#revised-paragraph}
```

```
\DIFdelbegin \DIFdel{This }\DIFdelend  
\DIFaddbegin \DIFadd{In stable environments, this }  
\DIFaddend ability is fundamental for \DIFdelbegin  
\DIFdel{human beings as }\DIFdelend \DIFaddbegin \DIFadd  
{because }\DIFaddend it allows us to \DIFdelbegin \DIFdel  
{act optimally in stable environments }\DIFdelend  
\DIFaddbegin \DIFadd{perform optimally }\DIFaddend with  
relatively little effort.
```

```
% ~@>
```

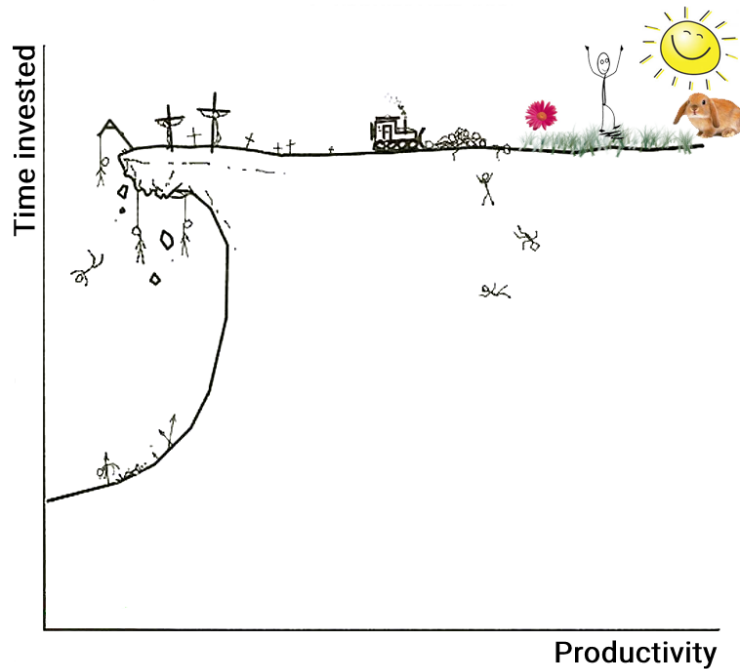
# Revision letter template

## Cross-referencing

- Reviewer comments
- Elements of the manuscript
  - Figures and tables
  - Numbered sections
  - Pages

# A quick demonstration

# papaja



## Getting started

1. GitHub repository
2. Open workshop materials

# papaja

## Summary

- From raw data to submission-ready manuscript
- Copy-paste-less revision letter
- Many published examples



Thanks for having me!