

# Example APA-style documents generated by R Markdown

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This is an example of creating an approximately APA-style manuscript using R Markdown and .bib files

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This is a simple example of using R Markdown documents to create APA-formatted documents with LaTeX compiling them into PDFs. You will need to install a version of LaTeX to compile; if you do not have one, you'll find information about using TinyTeX (Xie, 2019) for this purpose here. Before installing TinyTeX, I recommend ensuring that you have up-to-date versions of RStudio, R, and (if you're using a Windows computer) Rtools.

Then, install the `{tinytex}` package and use it to install TinyTeX:

```
install.packages('tinytex')
tinytex::install_tinytex()
```

After installation, you may need to install the `apa7` LaTeX package (Beitzel, 2021) with the command `tinytex::tlmgr_install("apa7")` – I have tested this on a Windows computer (RStudio version 1.4.1106; R Version 4.0.5) and seen that it will install the relevant package; however, knitting the document for the first time will also result in the installation of other missing packages. (For more information, see here.)

If TinyTeX does not work for you or if you intend to use LaTeX for other work, you may want to install MacTeX for Macs or MiKTeX for PCs. (These are large installations—thus the point of a “tiny” version.)

You will also have to compile your references in a bibliography. Most folks recommend using Zotero, as do I (manually maintaining references can be frustrating); you'll need to output your references to a .bib file. Document/article titles will follow the capitalization you've got—use APA style yourself! (The most recent versions of R Markdown can also help add your references, including just from a DOI link.)

Some packages (e.g., `{papaja}`, Aust & Barth, 2020) will create APA-draft manuscripts, but may introduce extra details beyond the basic style. (`{papaja}` is also not currently updated for APA-7.) The style I lay out here will simply create a document using APA formatting of references.

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This is an author's note; you could remove it if not desired. You could include a corresponding author, and their email.

## Why would I want to use this template?

You might think it's fun to lay your document out in R Markdown! You might also want to report the results of tests directly into your document, or include graphs. You might also be procrastinating finishing a paper, and that's fine, too.

I make no promises that this document will help you achieve “perfect” APA style—you'll need to double-check everything, especially your references. (In particular, if you are a student, make sure that this style conforms to any course/assignment requirements.)

## Getting started

You will need to download the `apa.csl` and `template.tex` documents into a directory where your Rmd file lives. Open (or create) your R Markdown document.

Your document will automatically include some YAML headers:

```
---
title: "Your title"
author: "Your name"
date: "3/29/2021"
output: pdf_document
---
```

You can keep the title and date, but you will need to update the others headers to include some of the following YAML headers in your R Markdown document. In particular, you must include the `doctype`, the full set of output parameters (`output: pdf_document`: `template: "template.tex"`), and the bibliography and `csl` lines. The others, including `shorttitle` and `lefthead`, `authors_note`, and so forth, are implemented in APA style documents.

```
---
doctype: man # this can be stu, jou, doc, or man
title: "Your title"
author:
  - name: "Your name"
    affiliation_number: 1
affiliations: "Your affiliation"
shorttitle: "APA short title"
authors_note: |
```

```

This is an author's note;
you could remove it if not desired.
abstract: "Your article's abstract"
keywords: "example, keywords"
date: "3/29/21"
output:
  pdf_document:
    template: "template.tex"
bibliography: example.bib # your .bib file
csl: apa.csl
---
```

A minimal example is included (minimal\_example.Rmd and minimal\_example.pdf) with these headers; feel free to download it and adapt. Without any changes, knitting it in R Markdown will make the PDF you can see here, so long as you have installed LaTeX—and downloaded the template.tex and apa.csl files into the same directory. (How to knit? Hit the “Knit” button in R Studio with the Rmd file open, or hit CMD+Shift+K / Ctrl+Shift+K.)

If you look at example.Rmd, you’ll see how to include multiple authors with differing affiliations. List each author separately. Including `affiliation_number` will provide a superscript number after that name, which then anticipates a subsequent item under affiliations. (If there are three `affiliation_numbers`, there should be three listed affiliations.) If an author has multiple affiliations, simply enclose the numbers in quotation marks, as below, separated with a comma: “2,3.”

```

author:
- name: "First Author"
  affiliation_number: 1
- name: "Second Author"
  affiliation_number: 2
- name: "Third Author"
  affiliation_number: "2,3"
- name: "Fourth Author"
  affiliation_number: 1
affiliations:
- "First Institution"
- "Other Institution"
- "Yet another Institution"
```

As described below, there are some additional headers you may include:

- **lefthead**: The authors’ last names (for `jou` doctype only)
- For the `stu` doctype, info about the course: **professor**, **course**, and **duedate**

There are additional YAML headers often used for different documents in R Markdown, many of which may work here.

## Document types

The `{apa7}` document class in LaTeX accepts four document types—they’re mentioned briefly above under doctype; you can try each out. Here’s what they are:

- *jou*: journal style; intended to mimic what a journal looks like (two columns, etc). This will look weird with the `minimal_example` file—it looks better with a longer file – this will also make use of the `YAML` `lefthead` and `shorttitle`, which will alternate page headers.
- *doc*: a one-column PDF output with APA style (including abstract, etc); it will try to be the “easiest to read”
- *man*: APA’s suggestion for how to submit documents to a journal—what many instructors ask for in college course, with double-spacing and so forth
- *stu*: student papers—includes `YAML` headers **professor**, **course**, and **duedate**; otherwise much like *man*

I’ve created versions of this Rmd file with each document style, so you can see what they might look like.

## Writing in an R Markdown file

Now that you have a working R Markdown file, you’ve chosen a document type, and you’ve updated it with your paper title and name, etc., your focus is on writing the document!

If you’ve ever looked into LaTeX document writing, this is more simple. There are three major things to keep in mind:

1. Use `#` to start a section, `##` to start a subsection, etc.
2. Use square brackets `[]` to enclose references, e.g., `[@referencekey]`, where you precede a key with the `@` symbol. The “reference key” is the way it will be referred in your `.bib` file—in `example.bib`, for example, you’ll see that it’s the first word of each entry. For more info on citations, see here.

Most other formatting will be done for you. If you want to learn things about formatting in R Markdown, there are a variety of cheatsheets available; you can refer to the `example.Rmd` document here to learn about links, lists, *italics* or **bold-face text**, etc.

## Including plots

As above, you can refer to the R Markdown cheatsheets to learn how to include pre-existing images. If you’d like to include *plots*, it’s as easy as including a code chunk and using R code to create the figure (this uses the `{palmerpenguins}` and `{ggplot2}` packages by Horst et al. (2020) and Wickham (2016), respectively, and code from the first.) Including `echo=FALSE`, `warning=FALSE` means that the plot is

printed but the code is not. If `echo` were `TRUE`, the code would also be printed.

R Markdown and LaTeX will try their best to fit the plot into the space allotted to it; you can play around with size by specifying a `out.width` in percentages or inches, as I show here. You may read about more options here, but note that full-page figures may be difficult when `doctype` is set as `jou`. (But see more below.)

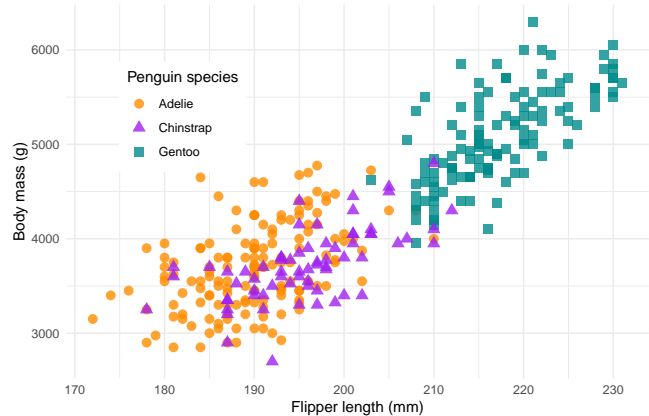
The below code produces the figure included in this document. Note that LaTeX places figures as best as it can—sometimes on a subsequent page. I abbreviate the figure caption in the code example:

```
``{r, fig.cap="Cap", out.width="100%"}
library(palmerpenguins); library(ggplot2)
ggplot(penguins, aes(x = flipper_length_mm,
                     y = body_mass_g)) +
  geom_point(aes(color = species,
                  shape = species),
             size = 3,
             alpha = 0.8) +
  theme_minimal() +
  scale_color_manual(values = c("darkorange",
                                "purple",
                                "cyan4")) +
  labs(title = "Penguin size, Palmer Station
            LTER",
       x = "Flipper length (mm)",
       y = "Body mass (g)",
       color = "Penguin species",
       shape = "Penguin species") +
  theme(legend.position = c(0.2, 0.7),
       legend.background =
         element_rect(fill = "white",
                      color = NA),
       plot.title.position = "plot",
       plot.caption =
         element_text(hjust = 0,
                      face = "italic"),
       plot.caption.position = "plot")
...`
```

You can also use—in `doctype: jou` documents—the `\begin{figure*}` environment of LaTeX to insert already-generated images across both columns; the code for this follows, but an additional image is only generated for `doctype: jou`. (Note that including images in the traditional R Markdown way—with code like `![Caption](path/to/image.png)`—will work as well, but will not span two columns.)

```
\begin{figure*}
\centering
\includegraphics{example_files/figure-latex/
```

Penguin size, Palmer Station LTER



**Figure 1**

*Flipper length and body mass for Adélie, Chinstrap and Gentoo Penguins.*

```
penguinimage.pdf}
\caption{Caption for image.}
\end{figure*}
```

### Multiple figures

You can even include multiple figures concurrently in one section using some tricks of R Markdown as described here; this is why it calls `extra_dependencies`: `"subfig"` in the YAML at the top. However, again, this will look relatively strange in `doctype: jou`, given that the images will not by default span both columns.

### Including tables

There are many great R packages for writing LaTeX tables in R; I won't cover them extensively here, but they include `{kableExtra}`, `{xtable}`, `{gt}`, `{gtsummary}`, and `{stargazer}`. Most of them don't automatically format their contents in APA style. This is one of the places where `{papaja}`, mentioned above, can be helpful; the R functions do indeed have some intentional formatting like `papaja::apa_table()` which will automatically format things *for LaTeX and in APA style*. See the document `tables_ex.Rmd` for more.

A simple example table is included here using the `knitr::kable()` function. Including the `caption` argument is required for the LaTeX `{apa7}` package to recognize it as a table and mark it with the heading "Table 1."

```
library(dplyr)
penguins %>%
  group_by(island, species) %>%
  summarize(
    n = n(),
    meanlength = mean(
```

Penguin size, Palmer Station LTER

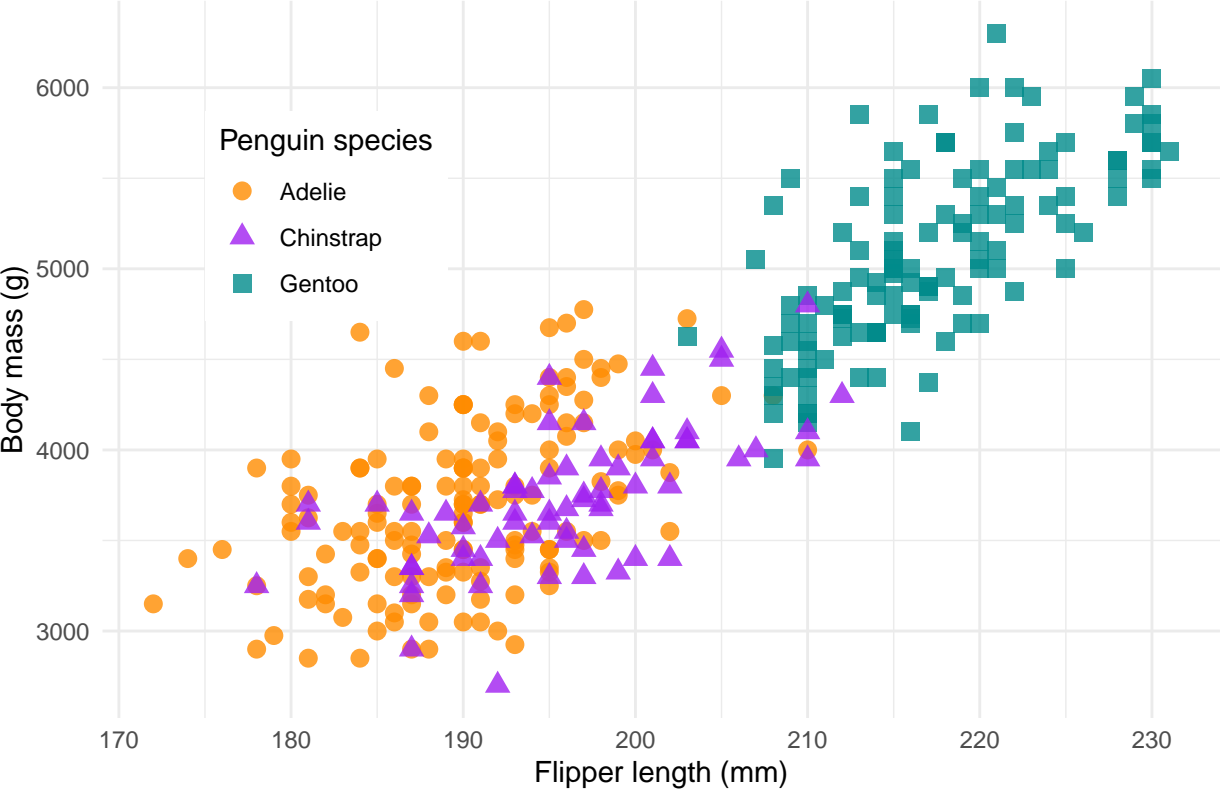


Figure 2

When included as an external file, images can be placed in `\begin{figure*}` environments `\endfigure*`; these will be placed where appropriate, but will by default take up the full `\textwidth`.

```
flipper_length_mm,
na.rm = TRUE),
sd = sd(flipper_length_mm,
na.rm = TRUE),
.groups = "drop"
) %>%
knitr::kable(format = "latex",
booktabs = TRUE,
escape = FALSE,
longtable = FALSE,
digits = 2,
col.names = c("Island",
"Species", "\\textit{n}",
"Flipper length (\\textit{M})",
"(\\textit{SD})"),
align = c("l", "l", "c", "c", "c"),
caption = "Summary of flipper lengths
across species and islands.")
```

Table 1

Summary of flipper lengths across species and islands.

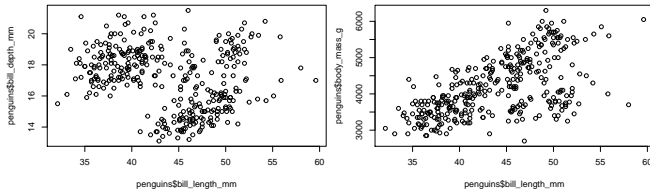
Island	Species	<i>n</i>	Flipper length ( <i>M</i> )	( <i>SD</i> )
Biscoe	Adelie	44	188.80	6.73
Biscoe	Gentoo	124	217.19	6.48
Dream	Adelie	56	189.73	6.59
Dream	Chinstrap	68	195.82	7.13
Torgersen	Adelie	52	191.20	6.23

More information

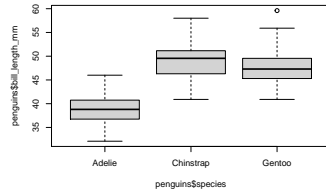
The reader hoping for more information should review some of the following books:

- R Markdown: The Definitive Guide by Yihui Xie, J. J. Allaire, Garrett Golemund
- R Markdown Cookbook by Yihui Xie, Christophe Dervieux, & Emily Riederer

(a) Penguin bill length negatively correlates with penguin bill depth (b) Penguin bill length positively correlates with penguin body mass



(c) Boxplot of penguin bill lengths by species



**Figure 3**

*Different ways of looking at penguin bills. Note that this sort of multiple-figure-in-one-section plot will look best in doctypes man, doc, and stu – and be a bit abbreviated in doctype jou.*

- bookdown: Authoring Books and Technical Documents with R Markdown by Yihui Xie

### Wrapping up

You needn't write anything below the title of your references section—the bibliography will be automatically generated. If

you notice that something is inappropriately not capitalized, make sure it is capitalized correctly in your .bib file; if it is, consider surrounding it with curly brackets to ensure the correct formatting.

### References

- Aust, F., & Barth, M. (2020). *papaja: Create APA manuscripts with R Markdown*. <https://github.com/crsh/papaja>
- Beitzel, B. D. (2021). *Formatting documents in APA style (7th Edition) with the apa7 LaTeX class*. <http://ctan.math.washington.edu/tex-archive/macros/latex/contrib/apa7/apa7.pdf>
- Horst, A. M., Hill, A. P., & Gorman, K. B. (2020). *palmer-penguins: Palmer Archipelago (Antarctica) penguin data*. <https://allisonhorst.github.io/palmerpenguins/>
- Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis*. Springer-Verlag New York. <https://ggplot2.tidyverse.org>
- Xie, Y. (2019). TinyTeX: A lightweight, cross-platform, and easy-to-maintain LaTeX distribution based on TeX live. *TUGboat*, 1, 30–32. <http://tug.org/TUGboat/Contents/contents40-1.html>