Session 17 Script: R notebook using R markdown to produce a literate program

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This is an R Markdown Notebook. When you execute code within the notebook, the results appear beneath the code. Try executing the chunk below by clicking the *Run* button within the chunk or by placing your cursor inside it and pressing *Ctrl+Shift+Enter*.

Since the code chunk below includes the header argument "echo = FALSE" you will only see its outputs when you compile the dynamic document.

Compile date and session info

```
## [1] "Mon Mar 10 12:38:43 2025"
```

```
## R version 4.4.2 (2024-10-31 ucrt)
## Platform: x86_64-w64-mingw32/x64
## Running under: Windows 11 x64 (build 26100)
##
## Matrix products: default
##
##
## locale:
## [1] LC_COLLATE=English_United States.utf8
## [2] LC_CTYPE=English_United States.utf8
## [3] LC_MONETARY=English_United States.utf8
## [4] LC_NUMERIC=C
## [5] LC_TIME=English_United States.utf8
##
## time zone: America/Chicago
## tzcode source: internal
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] ggplot2_3.5.1
##
## loaded via a namespace (and not attached):
##  [1] vctrs_0.6.5       cli_3.6.4         knitr_1.49        rlang_1.1.5
##  [5] xfun_0.50         generics_0.1.3    glue_1.8.0        colorspace_2.1-1
##  [9] htmltools_0.5.8.1 tinytex_0.55      scales_1.3.0      rmarkdown_2.29
## [13] grid_4.4.2        evaluate_1.0.3    munsell_0.5.1     tibble_3.2.1
## [17] fastmap_1.2.0     yaml_2.3.10       lifecycle_1.0.4   compiler_4.4.2
## [21] dplyr_1.1.4       pkgconfig_2.0.3   rstudioapi_0.17.1 digest_0.6.37
```

```
## [25] R6_2.6.1          tidyselect_1.2.1  pillar_1.10.1     magrittr_2.0.3
## [29] withr_3.0.2       tools_4.4.2       gtable_0.3.6
```

An example using a paired Student's *t*-test

This document first includes by direct input data from an experiment in which ten mice were fed an experimental drug and weighed before and after the experiment. The goal was to determine if the mice would gain a meaningful amount of weight before and after the administration of drug. Hence we have ten pairs of weights, each representing the two measurements of weight in each mouse. The code below shows the entry of the data directly, as well as some minor tidying followed by execution of the paired Student's *t*-test using the data either input as two separate vectors.

```
# Weight of the mice before treatment
before <- c(200.1, 190.9, 192.7, 213, 241.4, 196.9, 172.2, 185.5, 205.2, 193.7)
# Weight of the mice after treatment
after <- c(392.9, 393.2, 345.1, 393, 434, 427.9, 422, 383.9, 392.3, 352.2)

# Create a data frame
my_data <- data.frame(group = rep(c("before", "after"), each = 10),
                      weight = c(before,  after))

my_data$id <- rep(1:10, times = 2)

# Compute t-test using two different numeric vectors
res1 <- t.test(after, before, paired = TRUE)
res1
```

```
##
##  Paired t-test
##
## data:  after and before
## t = 20.883, df = 9, p-value = 6.2e-09
## alternative hypothesis: true mean difference is not equal to 0
## 95 percent confidence interval:
##  173.4219 215.5581
## sample estimates:
## mean difference
##          194.49
```

Making a plot

The *ggplot* code below will produce a plot which if included in a code chunk will be automatically placed into the document. Adding the "echo = FALSE" argument to the code chunk header makes a clean entry for the plot with only plot output.

Including R inline code

The above code chunks only put outputs into the documents as whole sections in a document. From time to time you may want to directly include elements from R directly inside the course of a sentence.

For example: The results of a Student's paired *t*-test applied to the before and after mice weight dataset were highly significant with an estimated mean of the difference in weight of 194.49 grams (p-value < 0.001) between the measurements of weight before and after treatment.

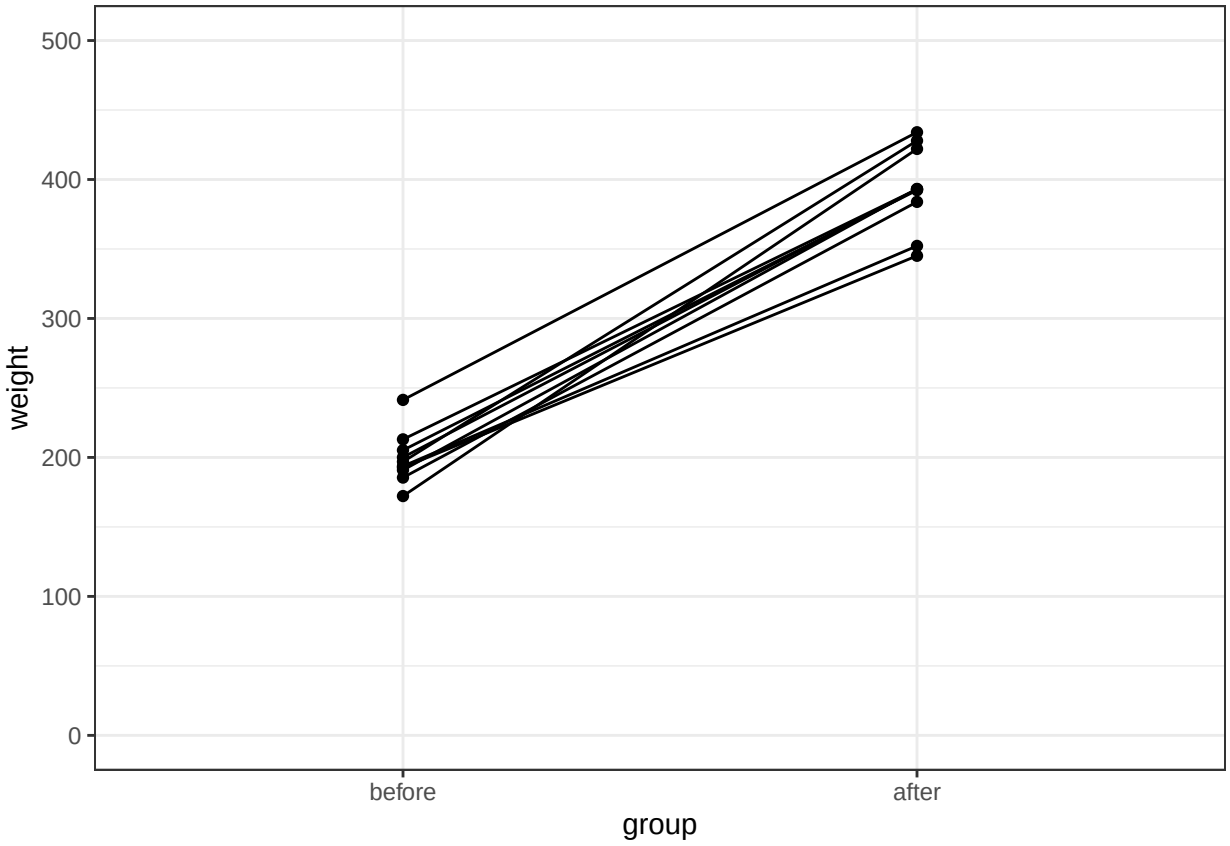

Figure 1: Example Figure