

# Lab 2 Analysis

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## Import packages

```
require(tidyverse)
require(lubridate)
```

## Import data

We need to get our data into R before we can actually do any work. The `read.csv()` function goes hunting for a `.csv` file with that name and assigns it to the variable `human`. The rest of the stuff inside the `()` just tells the `read.csv()` function that we have headers, and that our file is comma-separated.

```
do_data <- read.csv(file = "lab2_monday.csv", header = T, sep = ",") %>%
  mutate(TIME_INITIAL = mdy_hm(TIME_INITIAL),
         TIME_FINAL = mdy_hm(TIME_FINAL))
```

## Calculations

First need to get elapsed time.

```
do_data <- do_data %>%
  mutate(ELAPSED_TIME = TIME_FINAL - TIME_INITIAL) %>% # returns elapsed time in hours
  mutate(DELTA_DO = DO_FINAL - DO_INITIAL) %>%
  mutate(DELTA_DO_WEIGHT_HOUR = DELTA_DO/(as.numeric(ELAPSED_TIME)*WEIGHT))
```

Respiration values can be directly measured from the dark bottles, so we can pull the values from the data frame above for the t-test.

```
algae_r <- do_data %>%
  filter(ORGANISM == "algae") %>%
  filter(TREATMENT == "dark")

macrophyte_r <- do_data %>%
  filter(ORGANISM == "macrophyte") %>%
  filter(TREATMENT == "dark")

respiration_t <- t.test(algae_r$DELTA_DO_WEIGHT_HOUR, macrophyte_r$DELTA_DO_WEIGHT_HOUR)

respiration_t

##
## Welch Two Sample t-test
##
## data:  algae_r$DELTA_DO_WEIGHT_HOUR and macrophyte_r$DELTA_DO_WEIGHT_HOUR
## t = 1.6923, df = 4.7033, p-value = 0.1551
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
## -0.07040011 0.32720472
## sample estimates:
## mean of x mean of y
## -0.1594368 -0.2878391
```

After the t-test, we can summarise the respiration values for both organisms below for plotting.

```
respiration <- do_data %>%
  filter(TREATMENT == "light") %>%
  group_by(ORGANISM) %>%
  summarise(RESPIRATION_MEAN = mean(DELTA_DO_WEIGHT_HOUR),
            RESPIRATION_SE = sd(DELTA_DO_WEIGHT_HOUR)/sqrt(n()))
```

Net photosynthesis can be measured from the light bottles, but to calculate gross photosynthesis we need to cancel out the effects of respiration.

```
gross_photosynthesis <- do_data %>%
  filter(TREATMENT == "dark") %>%
  mutate(GROSS_PHOTOSYNTHESIS = case_when(ORGANISM == "algae" ~ DELTA_DO_WEIGHT_HOUR + 1.818,
                                           ORGANISM == "macrophyte" ~ DELTA_DO_WEIGHT_HOUR + 1.841))
```

Then split the data and pull the values out for the t-test like above.

```
algae_gross <- gross_photosynthesis %>%
  filter(ORGANISM == "algae")

macrophyte_gross <- gross_photosynthesis %>%
  filter(ORGANISM == "macrophyte")

gross_t <- t.test(algae_gross$GROSS_PHOTOSYNTHESIS, macrophyte_gross$GROSS_PHOTOSYNTHESIS)

gross_t

##
## Welch Two Sample t-test
##
## data:  algae_gross$GROSS_PHOTOSYNTHESIS and macrophyte_gross$GROSS_PHOTOSYNTHESIS
## t = 1.3892, df = 4.7033, p-value = 0.227
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.09340011 0.30420472
## sample estimates:
## mean of x mean of y
## 1.658563 1.553161
```

And like above, we need to summarise the values for plotting gross photosynthesis.

```
gross_photo_mean <- gross_photosynthesis %>%
  group_by(ORGANISM) %>%
  summarise(GROSS_MEAN = mean(GROSS_PHOTOSYNTHESIS),
            GROSS_SE = sd(GROSS_PHOTOSYNTHESIS)/sqrt(n()))
```

## Plotting

```
respiration_plot <- ggplot() +
  geom_col(data = respiration,
```

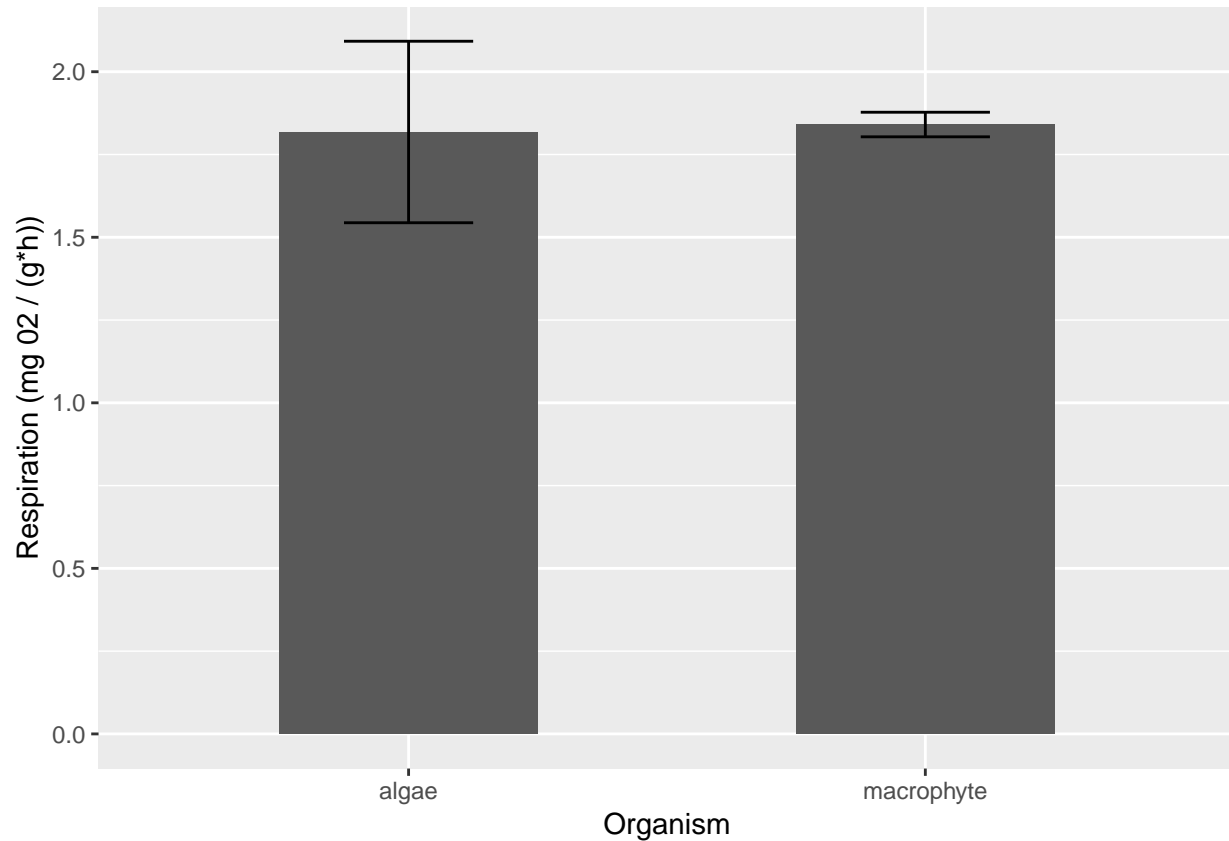


Figure 1: This is a really nice way to make figure captions without worrying about formatting in Microsoft Word

```

aes(x = ORGANISM, y = RESPIRATION_MEAN),
width = 0.5) +
geom_errorbar(data = respiration,
aes(x = ORGANISM,
ymin = RESPIRATION_MEAN - RESPIRATION_SE,
ymax = RESPIRATION_MEAN + RESPIRATION_SE),
width = 0.25) +
xlab("Organism") +
ylab("Respiration (mg O2 / (g*h))")

```

respiration\_plot

```

gross_plot <- ggplot() +
geom_col(data = gross_photo_mean,
aes(x = ORGANISM, y = GROSS_MEAN),
width = 0.5) +
geom_errorbar(data = gross_photo_mean,
aes(x = ORGANISM,
ymin = GROSS_MEAN - GROSS_SE,
ymax = GROSS_MEAN + GROSS_SE),
width = 0.25) +
xlab("Organism") +

```

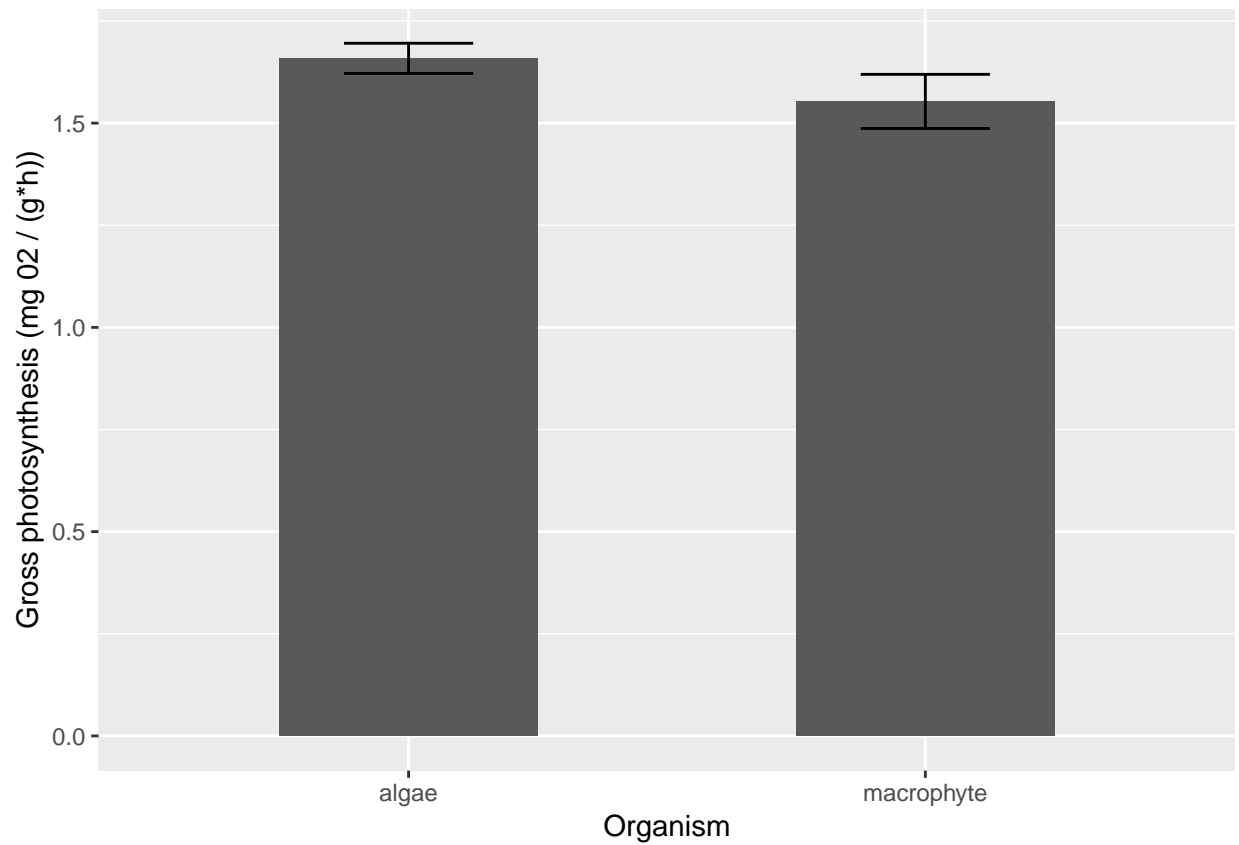


Figure 2: This is a really nice way to make figure captions without worrying about formatting in Microsoft Word

```
ylab("Gross photosynthesis (mg O2 / (g*h))")  
gross_plot
```