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_tuesday.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 = 0.029168, df = 2.8811, p-value = 0.9786
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
##  -2.090636  2.128407
## sample estimates:
## mean of x mean of y
## -1.347269 -1.366155
```

After the t-test, we can summarise the respiration values (from the dark bottles) for both organisms below for plotting.

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

Gross photosynthesis calculations

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

```
gross_photosynthesis <- do_data %>%
  filter(TREATMENT == "light") %>%
  mutate(GROSS_PHOTOSYNTHESIS = case_when(ORGANISM == "algae" ~ DELTA_DO_WEIGHT_HOUR + 1.347,
                                          ORGANISM == "macrophyte" ~ DELTA_DO_WEIGHT_HOUR + 1.366))
```

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 = 3.8505, df = 5.0934, p-value = 0.01158
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  1.608289 7.963013
## sample estimates:
## mean of x mean of y
##  12.55408   7.76843
```

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()))
```

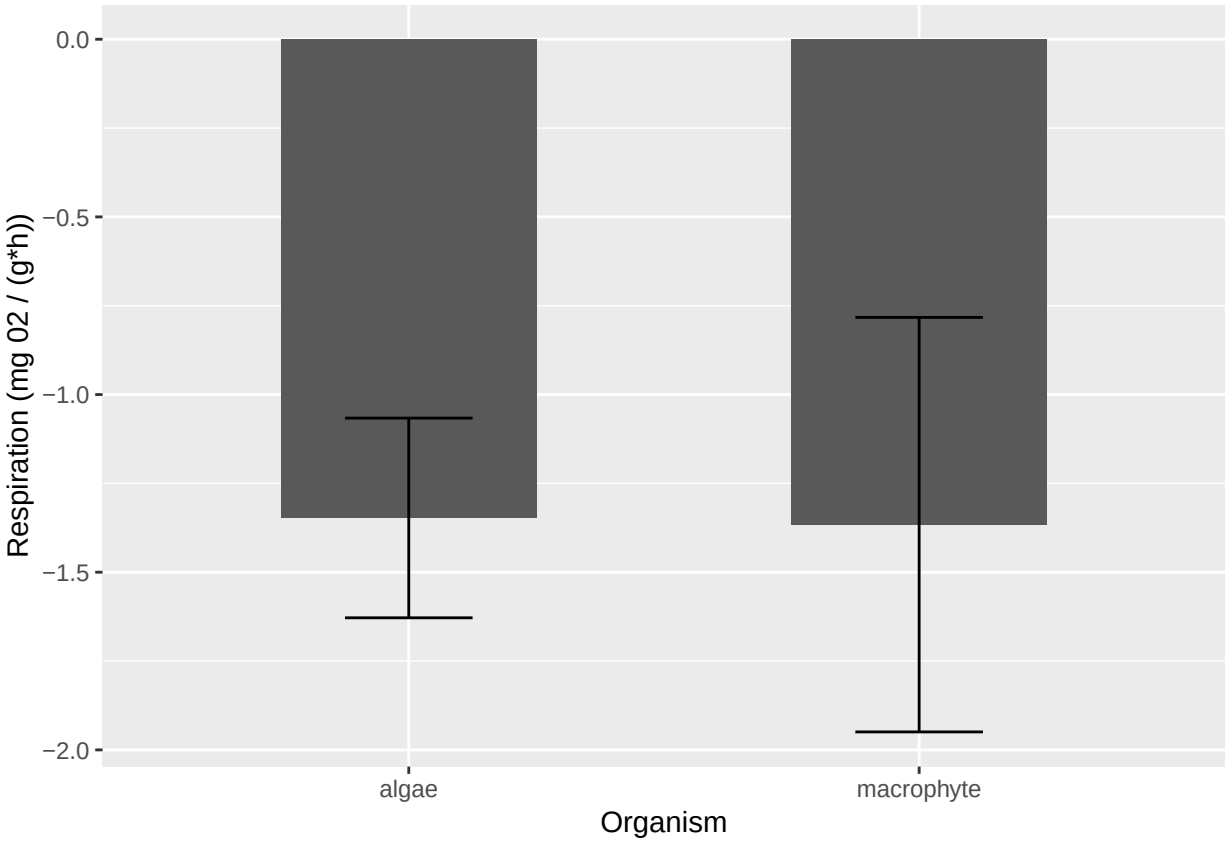

Figure 1: This is a really nice way to make figure captions without worrying about formatting in Microsoft Word

Plotting

```
respiration_plot <- ggplot() +
  geom_col(data = respiration,
           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 02 / (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,
```

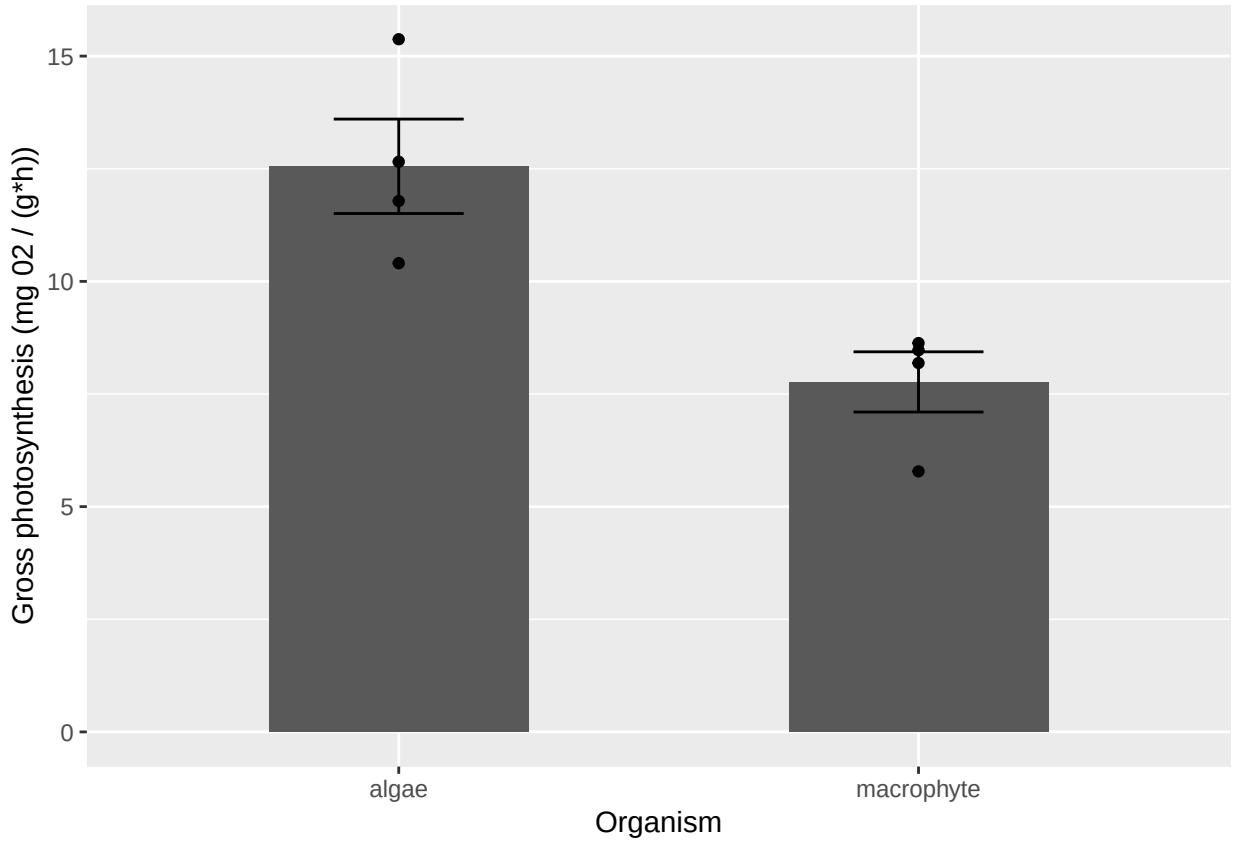

Figure 2: This is a really nice way to make figure captions without worrying about formatting in Microsoft Word

```
                    ymin = GROSS_MEAN - GROSS_SE,
                    ymax = GROSS_MEAN + GROSS_SE),
                width = 0.25) +
  geom_point(data = gross_photosynthesis,
             aes(x = ORGANISM, y = GROSS_PHOTOSYNTHESIS)) +
  xlab("Organism") +
  ylab("Gross photosynthesis (mg 02 / (g*h))")

gross_plot
```