

Darwin's Plant Heights

Pairs of self-fertilized and open-crossed seeds from same mother plant. Pairs grown in same pot. Response is height in inches. Does out-crossing improve height?

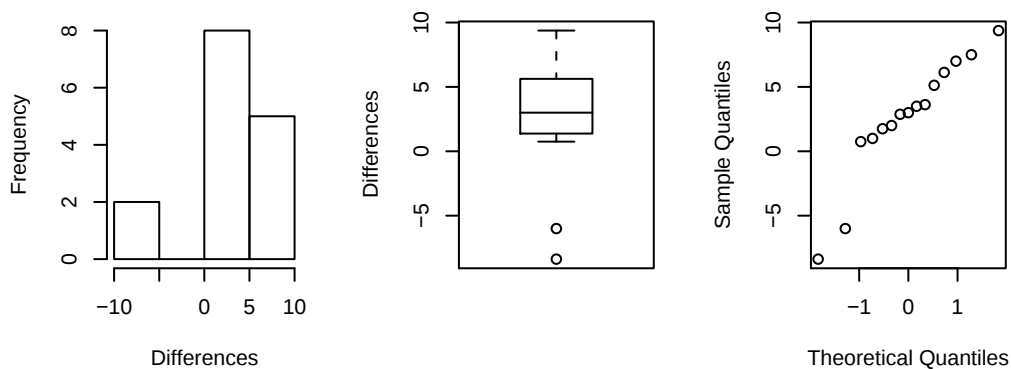


Figure 1: Distribution of differences in plant heights for crossed and self-pollinated seeds.

Paired testing procedures: paired t-test and Wilcoxon Signed Rank test. Assumptions?

```
> t.test(cross, self, paired=T)
```

Paired t-test

```
data: cross and self
t = 2.148, df = 14, p-value = 0.0497
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.003899165 5.229434169
sample estimates:
mean of the differences
      2.616667
```

```
> wilcox.test(cross, self, paired=T)
```

Wilcoxon signed rank test

```
data: cross and self
V = 96, p-value = 0.04126
alternative hypothesis: true mu is not equal to 0
```

Conclusions?

Sunscreen SPF

A Sunlight Protection Factor (SPF) of 5 means an individual that can tolerate X minutes of sunlight without any sunscreen can tolerate $5X$ minutes with sunscreen. A paired design more powerful than two sample design. Data in sunscreen.dat are based on 13 patients with pre-treatment and during treatment measurements.

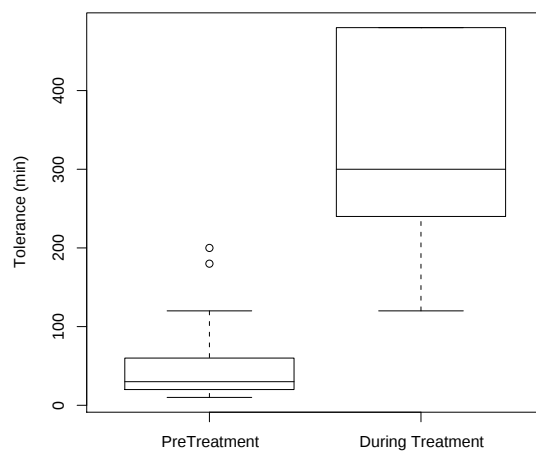


Figure 2: Tolerance to sunlight in minutes for 13 patients.

Goals: estimate SPF

- Assumptions?
- Models?
- Conclusions?
- Generalization to Population?
- Confounding Variables?