

# Inferential Analysis of effect of Vit. C on Tooth Growth

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## Overview

In this report, toothgrowth data is analyzed to draw inferences. `t.test()` is used to analyze correlation between vit. C and tooth growth. It is analyzed by intake type and dosage.

```
data(ToothGrowth)  #load the data
head(ToothGrowth)
```

```
##      len supp dose
## 1   4.2   VC  0.5
## 2  11.5   VC  0.5
## 3   7.3   VC  0.5
## 4   5.8   VC  0.5
## 5   6.4   VC  0.5
## 6  10.0   VC  0.5
```

```
str(ToothGrowth)
```

```
## 'data.frame':   60 obs. of  3 variables:
##  $ len : num  4.2 11.5 7.3 5.8 6.4 10 11.2 11.2 5.2 7 ...
##  $ supp: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 ...
##  $ dose: num  0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 ...
```

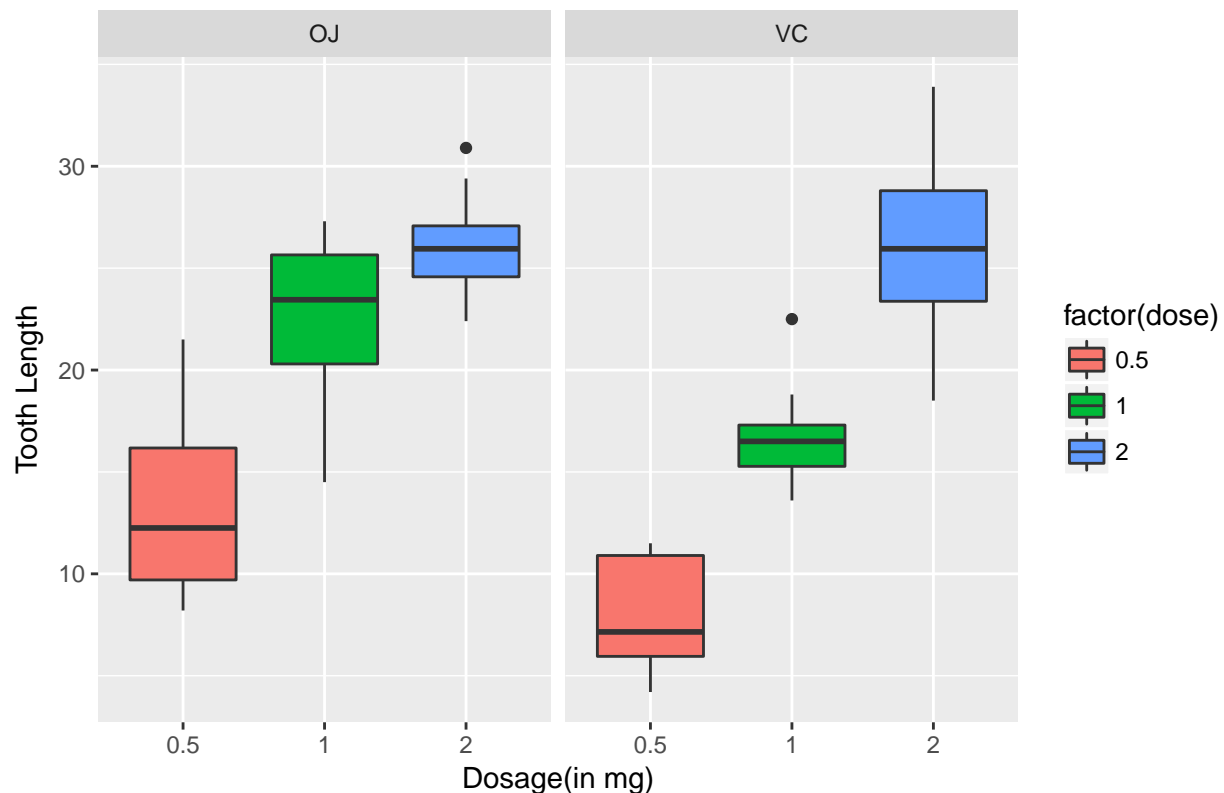
## Provide basic summary of data

```
ToothGrowth$dose <- as.factor(ToothGrowth$dose)
table(ToothGrowth$supp, ToothGrowth$dose)
```

```
##
##      0.5  1  2
##   OJ  10 10 10
##   VC  10 10 10
```

A simple boxplot already gives a good idea of what the conclusions are going to be.

## Effect of Dosage and Supplement Type on Tooth Growth



The plot above shows that tooth growth is affected by dosage, and that OJ(orange juice) is better than VC(ascorbic acid). The difference seems to disappear at the higher dosage of 2 mg. We can confirm if there is a difference using a t test. The null hypothesis here is that there is no difference.

```
x <- t.test(len ~ supp, paired=FALSE, var.equal=FALSE, data=ToothGrowth[ToothGrowth$dose == 0.5, ])
x$conf.int
```

```
## [1] 1.719057 8.780943
## attr("conf.level")
## [1] 0.95
```

```
x$estimate
```

```
## mean in group OJ mean in group VC
##          13.23          7.98
```

The confidence interval does not include zero and the null hypothesis is rejected for dosage = 0.5 mg.

```
x <- t.test(len ~ supp, paired=FALSE, var.equal=FALSE, data=ToothGrowth[ToothGrowth$dose == 1, ])
x$conf.int
```

```
## [1] 2.802148 9.057852
## attr("conf.level")
## [1] 0.95
```

```
x$estimate
```

```
## mean in group OJ mean in group VC
##          22.70          16.77
```

For the dosage = 1 mg, the null hypothesis is also rejected.

```
x <- t.test(len ~ supp, paired=FALSE, var.equal=FALSE, data=ToothGrowth[ToothGrowth$dose == 2, ])
x$conf.int

## [1] -3.79807  3.63807
## attr(,"conf.level")
## [1] 0.95

x$estimate

## mean in group OJ mean in group VC
##           26.06           26.14
```

At dosage = 2 mg, the 95% confidence interval includes zero right in the middle. The difference in means between the two vit C delivery sources is not statistically significant.

## Conclusions

1. Higher dosages of vit. C leads to improved tooth growth.
2. OJ gives better tooth growth than VC.
3. The difference in tooth growth becomes insignificant at 2 mg. dosage

## Assumptions

1. The variances between sample populations are not equal.
2. The sample data is not paired.