Effects of Vitamin C on Tooth Growth in Guinea Pigs

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Background

A classic biological experiment was conducted to determine the effects of **vitamin C** on the tooth length of guinea pigs. The data records the **length of odontoblasts (cells responsible for tooth growth)** under different supplement types and dosages in 60 guinea pigs. In this brief analysis, I will:

1. Compute summary statistics for **tooth length**, categorized by **supplement type** and **dose level**.
2. Visualize the impact of **vitamin C dosage** and **delivery method** on guinea pig tooth growth using an interactive boxplot.
3. Interpret whether the **form of supplementation** (OJ vs. VC) and **dosage amount** significantly influence tooth development.

Summary Statistics

We begin by calculating the mean and standard deviation of **tooth length**, grouped by **supplement type** and **dosage level**, using the `dplyr` package.

Summary Statistics of Tooth Length by Supplement and Dose

Supplement	Dose_mg	Mean_Tooth_Length	SD_Tooth_Length
OJ	0.5	13.23	4.46
OJ	1.0	22.70	3.91
OJ	2.0	26.06	2.66
VC	0.5	7.98	2.75
VC	1.0	16.77	2.52
VC	2.0	26.14	4.80

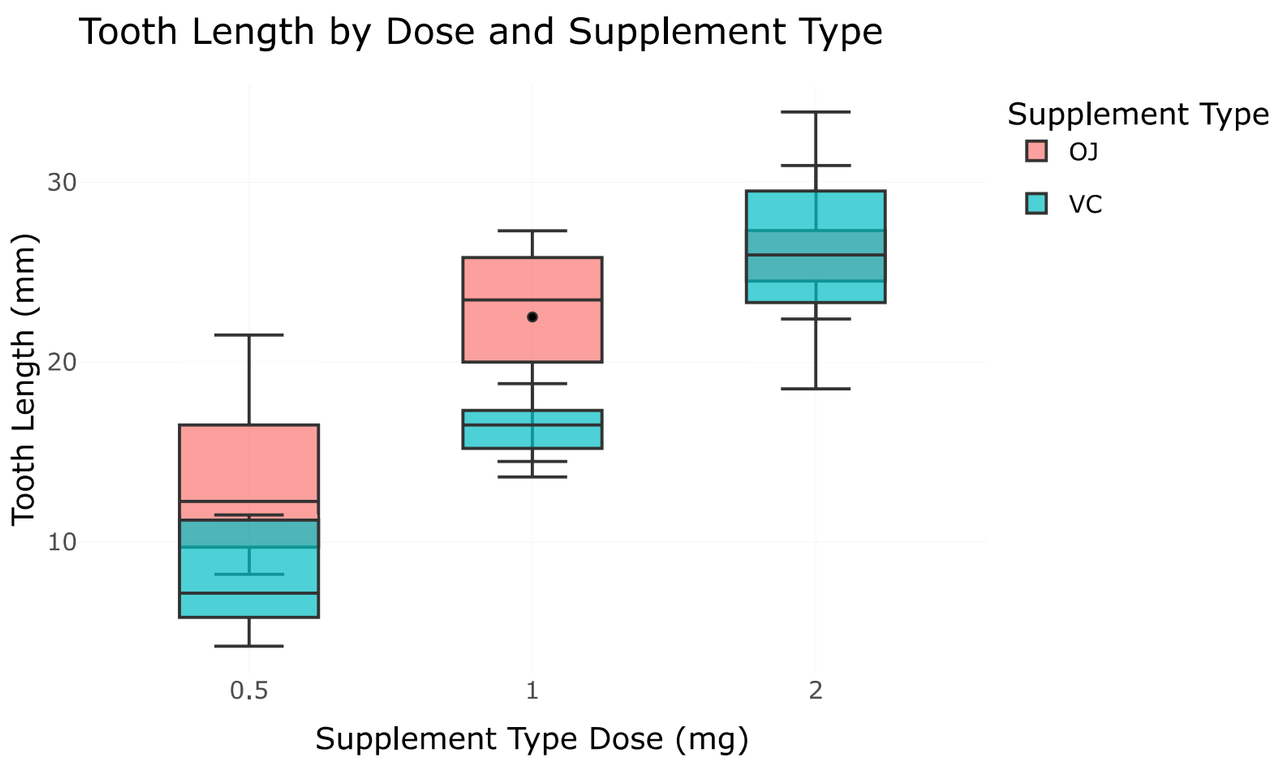
Effect of Supplement and Dose on Tooth Length

The following interactive boxplot compares Tooth Length (len) across different dosage levels and supplement types. It helps us observe how increasing the vitamin C dose affects tooth growth and whether the delivery method (Orange Juice vs. Vitamin C supplement) plays a role.

This visualization allows us to:

- Observe how increasing doses of Vitamin C (0.5, 1.0, and 2.0 mg) influence the average tooth growth in guinea pigs.

- Examine whether the form of Vitamin C delivery — either as Orange Juice (OJ) or a pure supplement (VC) — has a differential effect on tooth development.
- Identify potential interaction effects between dosage and supplement type, especially if the growth trends differ significantly across groups.
- By comparing the spread and central tendency (median) of tooth length distributions within each group, we aim to determine the optimal dose and delivery method for promoting tooth growth.



Interpretation of Relationship

- There’s a clear positive effect of increasing vitamin C dosage on tooth length: higher doses generally result in longer teeth.
- At each dose level, orange juice (OJ) tends to produce slightly greater tooth growth than the synthetic vitamin C supplement (VC), especially at the 0.5 mg and 1.0 mg levels.
- These patterns suggest that both dosage and delivery method significantly influence tooth development in guinea pigs, with a potential interaction between the two factors.