A Study on Penguins: A Minimal Reproducible Example

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Abstract

This document is a minimal, reproducible manuscript using the penguins data set as an example.

Keywords: penguins, reproducibility, minimal, example

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Introduction

Penguins are fascinating creatures that inhabit various regions of the Southern Hemisphere, including Antarctica and surrounding islands. The study of penguins provides valuable insights into ecosystem dynamics, climate change impacts, and evolutionary biology (Jones, 2018; Smith, 2020).

This manuscript presents a minimal reproducible example utilizing the penguins dataset to demonstrate scientific workflows in R.

Methods

We conducted a Welch two-sample *t*-test to compare the average bill lengths between male and female penguins. The null hypothesis (H_0) states that there is no difference in bill lengths between male and female penguins, while the alternative hypothesis (H_1) suggests a significant difference.

The *t*-test was performed using the `t.test()` function in R, with a significance level of 0.05.

Results

Descriptive statistics of the data set are given in Table 1 and individual bill lengths are displayed in Figure 1.

The Welch Two Sample t-test testing the difference of bill_length_mm by sex (mean in group female = 42.10, mean in group male = 45.85) suggests that the effect is negative, statistically significant, and large (difference = -3.76, 95% CI [-4.87, -2.65], t(329.29) = -6.67, p < .001, Cohen's d = -0.73)

Discussion

The significant difference in bill lengths between male and female penguins suggests potential sexual dimorphism in this trait. This finding aligns with previous research indicating differential foraging strategies and resource partitioning between male and female penguins (Brown, 2015; Wilson, 2019).

Understanding the factors influencing bill morphology in penguins is crucial for

conservation efforts and ecosystem management, particularly in the face of ongoing environmental challenges.

References

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Jones, C. D. (2018). Penguins and climate change: An overview. *Environmental Science Review*, *8*, 45–58.

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Table 1

Descriptive Statistics

Variable	female (n=165)	male (n=168) (n=333)
species [Adelie], %	44.2	43.5
species [Chinstrap], %	20.6	20.2
species [Gentoo], %	35.2	36.3
island [Biscoe], %	48.5	49.4
island [Dream], %	37.0	36.9
island [Torgersen], %	14.5	13.7
Mean bill_length_mm (SD)	42.10 (4.90)	45.85 (5.37)
Mean bill_depth_mm (SD)	16.43 (1.80)	17.89 (1.86)
Mean flipper_length_mm (SD)	197.36 (12.50)	204.51 (14.55)
Mean body_mass_g (SD)	3862.27 (666.17)	4545.68 (787.63)
year [2007], %	30.9	31.0
year [2008], %	33.9	33.9
year [2009], %	35.2	35.1

Figure 1

Scatter Plot of Bill Lengths by Sex With Violin Plot Showing Quartiles