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 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 displayed in Table 1.

The t-test revealed a significant difference in bill lengths between male and female penguins ($t($329.29) = -6.67, $p < 0.001$). Female penguins (M = 42.1mm, SD = 4.9 mm) exhibited shorter bill lengths compared to male penguins (M = 45.85mm, SD = 5.37 mm).

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.

Smith, A. B. (2020). Penguin behavior: A comprehensive review. *Journal of Penguin Studies*, *15*, 123–135.

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Table 1

Summary Statistics

species	Adelie			Chinstrap			Gentoo		
Variable	N	Mean	SD	N	Mean	SD	N	Mean	SD
island	146			68			119		
... Biscoe	44	30%		0	0%		119	100%	
... Dream	55	38%		68	100%		0	0%	
... Torgersen	47	32%		0	0%		0	0%	
bill_length_mm	146	39	2.7	68	49	3.3	119	48	3.1
bill_depth_mm	146	18	1.2	68	18	1.1	119	15	0.99
flipper_length_mm	146	190	6.5	68	196	7.1	119	217	6.6
body_mass_g	146	3706	459	68	3733	384	119	5092	501
sex	146			68			119		
... female	73	50%		34	50%		58	49%	
... male	73	50%		34	50%		61	51%	
year	146	2008	0.81	68	2008	0.86	119	2008	0.79

Figure 1

Histogram with Scatter Plot of Bill Lengths by Sex