

A Study on Penguins: A Minimal Reproducible Example

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Author roles were classified using the Contributor Role Taxonomy (CRediT; <https://credit.niso.org/>) as follows: Josephine Zerna: conceptualization, writing; Christoph Scheffel: project administration, methodology

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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 Welch 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 t -test revealed a significant difference in bill lengths between male and female penguins ($t(329.29) = -6.67, p < 0.001$). Female penguins ($M = 42.1$ mm, $SD = 4.9$ mm) exhibited shorter bill lengths compared to male penguins ($M = 45.85$ mm, $SD = 5.37$ 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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- Smith, A. B. (2020). Penguin behavior: A comprehensive review. *Journal of Penguin Studies*, 15, 123–135.
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Table 1*Descriptive Statistics*

		female (N=165)		male (N=168)		unknown (N=11)	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
bill_length_mm							
	(N=342)	42.1	4.9	45.9	5.4	41.3	4.6
bill_depth_mm							
	(N=342)	16.4	1.8	17.9	1.9	16.6	2.2
flipper_length_mm							
	(N=342)	197.4	12.5	204.5	14.5	199.0	16.5
body_mass_g							
	(N=342)	3862.3	666.2	4545.7	787.6	4005.6	679.4
		N	Pct.	N	Pct.	N	Pct.
species	Adelie	73	44.2	73	43.5	6	54.5
	Chinstrap	34	20.6	34	20.2	0	0.0
	Gentoo	58	35.2	61	36.3	5	45.5
island	Biscoe	80	48.5	83	49.4	5	45.5
	Dream	61	37.0	62	36.9	1	9.1
	Torgersen	24	14.5	23	13.7	5	45.5
year	2007	51	30.9	52	31.0	7	63.6
	2008	56	33.9	57	33.9	1	9.1
	2009	58	35.2	59	35.1	3	27.3

Figure 1

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

