

Exploring Performance Factors in Powerlifting*

My subtitle if needed

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1 Introduction

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2 Data

2.1 Dataset

The data set used in this paper is obtained from OpenPowerlifting (cite). The data is a compilation and standardization of meet data within the sport of powerlifting across an variety of different meets. For example, “World Powerlifting”, “Internation Powerlifting Federation”, “National Powerlifting Leauge”, etc. Organizers of the meets, record their sex, age, weight and lifts performed by each competitor and this data is often made publicly available online.

Table 1: Preview of the cleaned dataset From OpenPowerlifting.

sex	age_class	weight_class_kg	best3bench_kg	best3squat_kg	best3deadlift_kg	total_kg	wilks
Female	24-34	60-69	60.0	80.0	107.5	247.5	282.18
Female	40-44	70-79	67.5	105.0	110.0	282.5	272.99
Male	16-17	70-79	62.5	100.0	105.0	267.5	206.49
Male	35-39	70-79	122.5	137.5	170.0	430.0	334.94
Male	24-34	70-79	50.0	90.0	125.0	265.0	193.55
Male	16-17	80-89	60.0	100.0	115.0	275.0	189.56

*Code and data are available at: <https://github.com/eatingcorn/powerlift>

The dataset was filtered to contain only individuals that are tested and have not been disqualified to ensure the integrity of the data for the analysis. The majority of attributes in the original dataset were not employed, as the primary focus of this paper lies in analyzing the factors contributing to strength gains in powerlifting. The cleaned dataset contains 8 attributes:

1. **sex** - Denotes the lifter's gender, (Male or Female).
2. **age_class** - Denotes the lifter's age category.
3. **weight_class_kg** - Denotes the lifter's weight category (in kilograms).
4. **best3bench_kg** - Denotes the lifter's best bench press weight (out of 3 attempts, in kilograms).
5. **equipment** - Denotes the lifter's equipment used in the lift (Wraps, Raw, Unlimited, Single-py, Multi-py).
6. **best3squat_kg** - Denotes the lifter's best squat weight (out of 3 attempts, in kilograms).
7. **best3deadlift_kg** - Denotes the lifter's best deadlift weight (out of 3 attempts, in kilograms).
8. **total_kg** - Denotes the lifter's total weight lifted based on the best 3 bench, squat, and deadlift.
9. **wilks** - Denotes the lifter's Wilks score, which is calculated based on sex, weight, and total weight lifted.

The **total_kg** attribute was chosen as it is the estimand in this paper. The **sex** attribute was necessary as there are strength differences between males and females, and averaging the lifts and wilks score separately by sex allows for a more accurate representation of the data. The attributes **age_class** and **weight_class_kg** were chosen as they correlate with an individual's lifting capacity. The **best3bench_kg**, **best3squat_kg**, **best3deadlift_kg**, and **wilks** attributes are necessary to visualize the increases and/or decreases in each lift based on the correlated attributes.

The analysis of the data set in (section), will be carried out using the R programming language (R Core Team 2023) and packages; tidyverse ([citeTidy?](#)), arrow ([citeArrow?](#)), and dplyr ([citeDplyr?](#)), we were able create simulations, clean the dataset and write tests. The figures and tables are generated using ggplot2 ([citeGgplot2?](#)) and knitr ([citeKnitr?](#)).

3 Model

The goal of our modelling strategy is twofold. Firstly,...

Here we briefly describe the Bayesian analysis model used to investigate... Background details and diagnostics are included in [Appendix B](#).

3.1 Model set-up

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$$y_i|\mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \tag{1}$$

$$\mu_i = \beta_0 + \beta_1 \times \text{sex}_i + \beta_2 \times \text{age}_i + \beta_3 \times \text{bodyweight}_i + \beta_4 \times \text{equipment}_i \tag{2}$$

$$\beta_0 \sim \text{Normal}(0, 2.5) \tag{3}$$

$$\beta_1 \sim \text{Normal}(0, 2.5) \tag{4}$$

$$\beta_2 \sim \text{Normal}(0, 2.5) \tag{5}$$

$$\beta_3 \sim \text{Normal}(0, 2.5) \tag{6}$$

$$\beta_4 \sim \text{Normal}(0, 2.5) \tag{7}$$

$$\sigma \sim \text{Exponential}(1) \tag{8}$$

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3.1.1 Model justification

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4 Results

4.1 Age Class, Bench, Squat, Deadlift

4.2 Weight Class, Bench, Squat, Deadlift

4.3 Equipment Used, Bench, Squat, Deadlift

5 Discussion

5.1 First discussion point

If my paper were 10 pages, then should be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

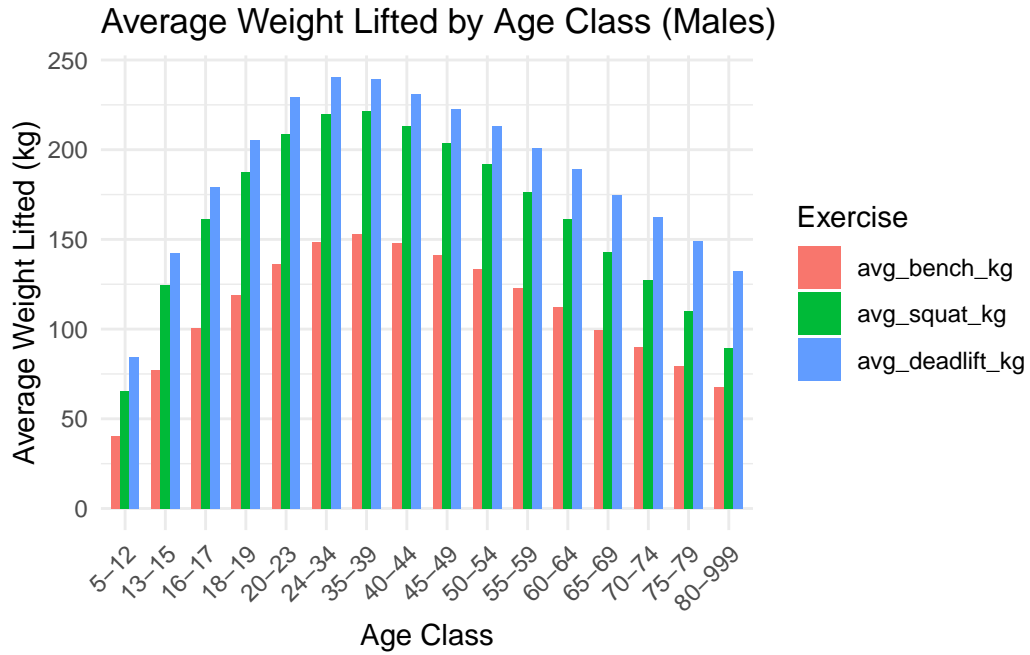


Figure 1: Average Bench, Squat, and Deadlift based on Age Class (Male)

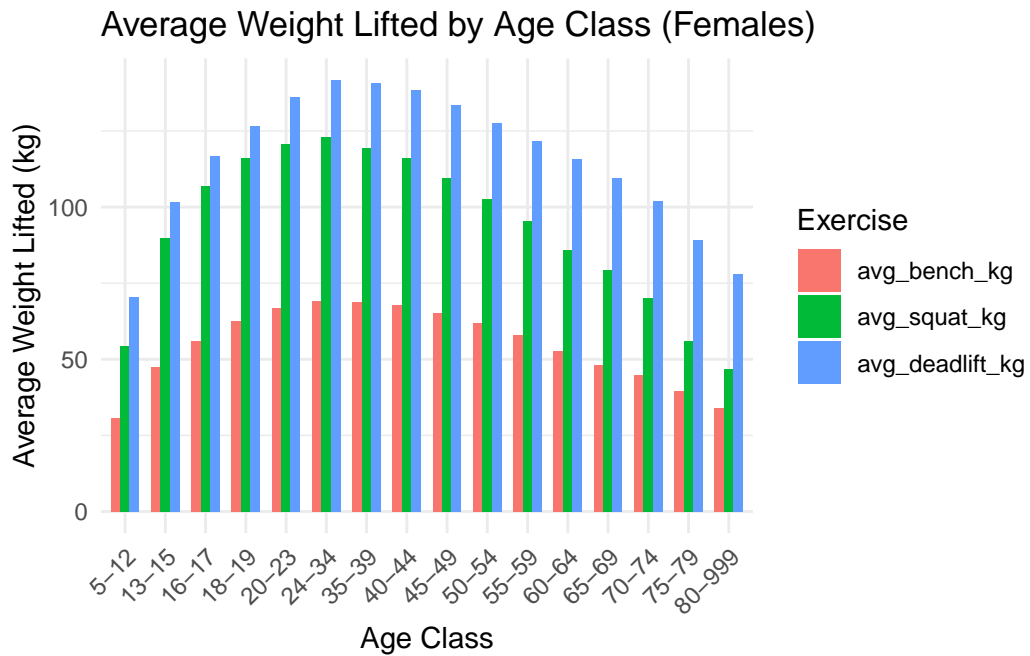


Figure 2: Average Bench, Squat, and Deadlift based on Age Class (Female)

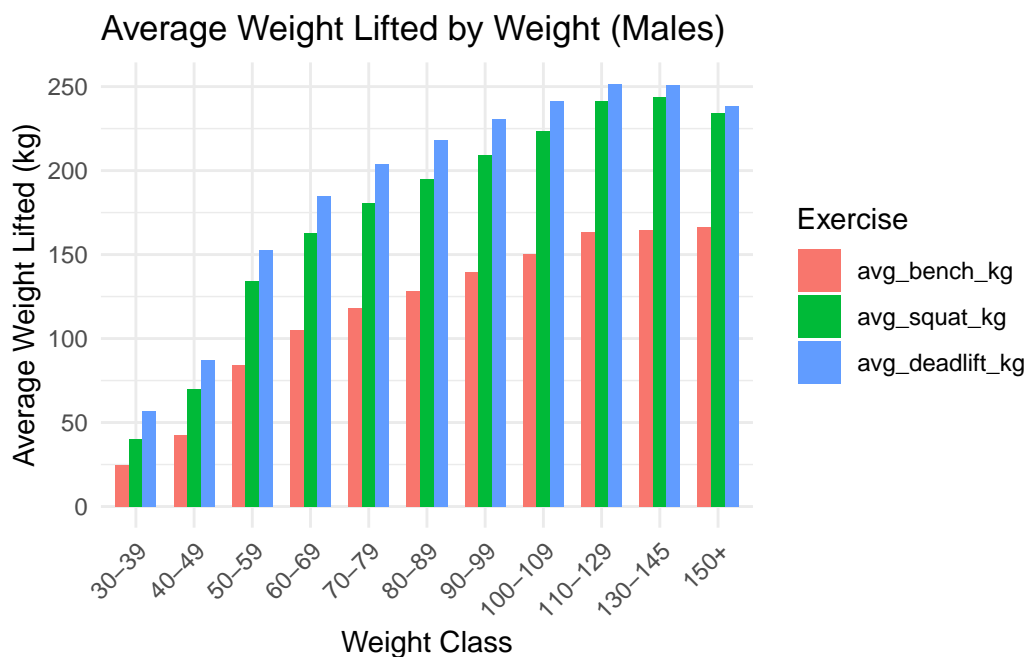


Figure 3: Average Bench, Squat, and Deadlift based on Weight Class (Female)

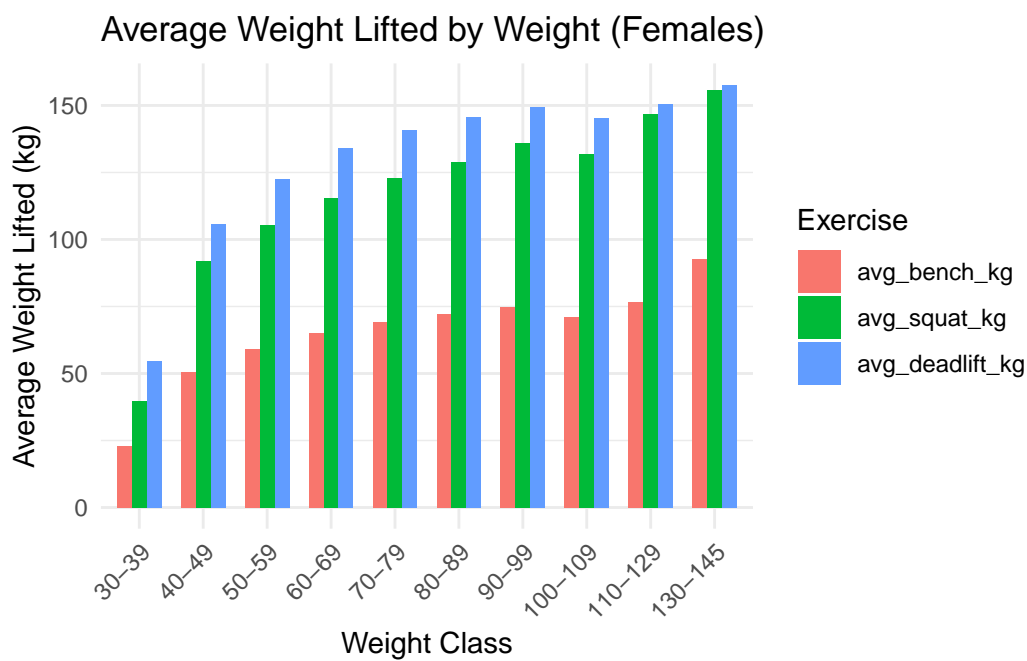


Figure 4: Average Bench, Squat, and Deadlift based on Weight Class (Female)

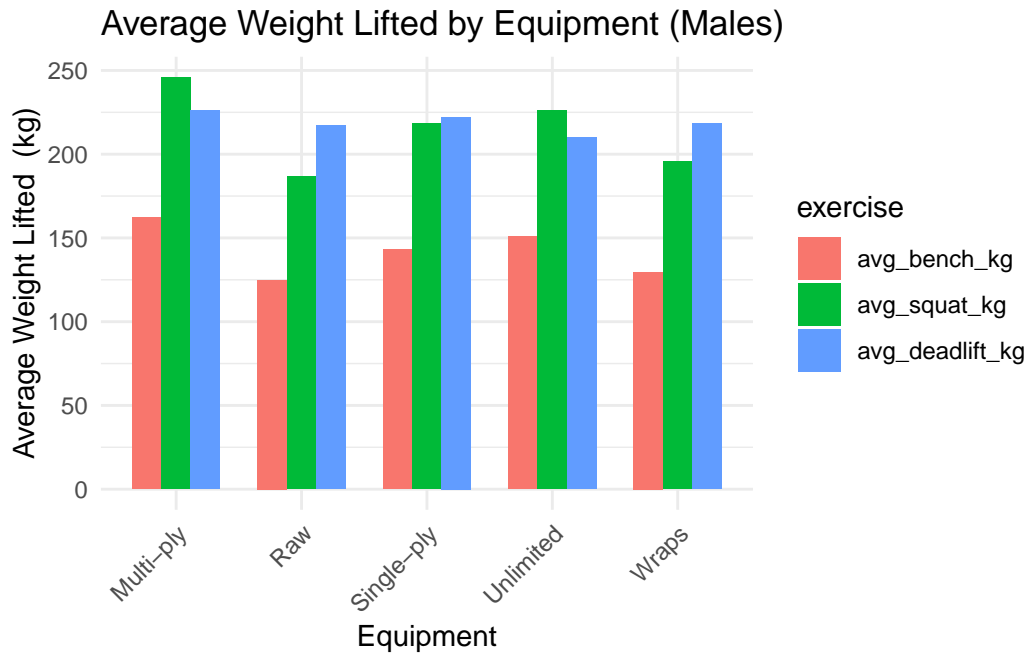


Figure 5: Average Bench, Squat, and Deadlift based on Equipment used (Female)

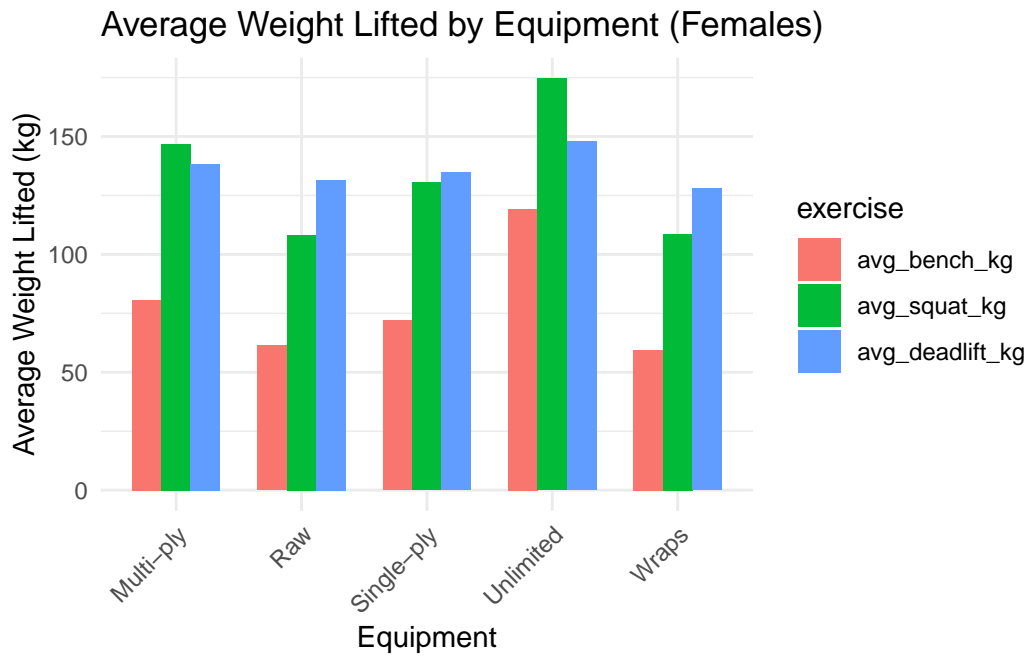


Figure 6: Average Bench, Squat, and Deadlift based on Equipment used (Female)

5.2 Second discussion point

5.3 Third discussion point

5.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional data details

B Model details

B.1 Posterior predictive check

In ?@fig-ppcheckandposteriorvsprior-1 we implement a posterior predictive check. This shows...

In ?@fig-ppcheckandposteriorvsprior-2 we compare the posterior with the prior. This shows...

B.2 Diagnostics

References

R Core Team. 2023. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.