**Exploring the Ratio of Dumbbell Press to Flat Bench Press**

**Many weightlifters wish to track the ratio between the weight they use for flat dumbbell press compared to barbell bench press.**

A **dumbbell** is a short bar with equal weight on both sides designed to be held in the lifter's hands. Flat dumbbell press is when the lifter lies on a flat bench with their arms positioned at roughly 45-degree angles, lifts two equal sized dumbbells, brings them back to the chest, and then keeps going.

A **barbell** is similar in shape to a dumbbell, but is a longer, much heavier bar where multiple weighted plates can be placed on either side. Barbell bench press is when the lifter lies on a bench with the barbell positioned at their chest, lifts the barbell, and then brings it back down.

**The goal of the ratio is to compare how much someone is lifting two dumbbells versus how much they are able to lift the weighted barbell. You obtain the ratio by multiplying the weight of one dumbbell by 2 (to account for the two weights that the person would hold) and dividing that weight by the amount someone is able to barbell bench press.**

**The data is sourced from a self-reported Reddit open forum[[1]](#footnote-1). Users provided their weight for both a flat dumbbell press and a barbell bench press, and it was compiled by another user into the corresponding weight ratio. It is important to note that as this is a self-reported open forum, biases may be introduced that wouldn't otherwise be present.**

A screenshot of a calculator

Description automatically generatedBelow is a dataset with observations from 18 weightlifters and their corresponding ratio, as well as summary statistics and visualizations for the data.

**A graph with a bar

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A screenshot of a cell phone

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**A graph with blue lines

Description automatically generated1.** The graph to the right shows a histogram of the collected data. Based on the histogram and the data table, what could be a concern regarding the spread of the data, and what is a possible solution.

The histogram shows that there is a lot of missing data resulting from a small sample size. From the data we have, the histogram being skewed right could be a concern. Because of the small sample size, getting a full picture of the actual spread of the data is difficult as not everything is being explained. The solution would be to gather more data points from a more diverse audience to get a better idea of the distribution and if the data is actually skewed or not.

**2.** What potential problems could arise from the way the data was collected?

Since the data was based on self-reporting and from an online open forum such as Reddit, we can’t guarantee that the data is 100% correct or reflective of the entire population. When self-reporting, there is bound to be bias and noise in the data. People who are looking at this reddit thread are already involved in the weightlifting community and part of the target audience. They might have higher ratios compared to the average person. This could lead to skewed data and inhibit us from seeing the whole picture.

**3.** Find the interquartile range (IQR) for the 18 weightlifters.

0.8020 –0.6650 = 0.137

**4.** Based on the IQR and using the “1.5 IQR Rule,” are there any discernable outliers in this dataset?

Low outliers below Q1 – IQR = anything below 0.6650 - 0.137 = 0.528

There are no low outliers because there are no observations below 0.528

High outliers above Q3 + IQR = anything above 0.8020 + 0.137 = 0.939

There are no high outliers because there are no observations above 0.939

**5.** Create a 95% confidence interval for the mean ratio between flat dumbbell press and barbell bench press.

Between 0.6822360 and 0.7690974

**6.** Say a weightlifter has a ratio of 0.45 and has a goal to become more “balanced” in order to fall within the confidence interval found in the previous question. What should the lifter do in order to achieve this? Explain both in terms of the ratio and the exercises involved.

The weightlifter would need to raise their ratio. They can become more balanced by getting better at flat dumbbell press (increasing numerator of ratio) so that it is closer to the amount they can barbell bench press (the denominator) and thus making the ratio larger.

**7.**  Considering your answer in question 2, do you believe that the population mean presented in this confidence interval is reliable? What audience would it apply to? Explain your answer.

Answers vary. A sample answer could mimic something like:

I don’t believe this population mean to be reliable. The sample size is too small and there is too much bias in data collection to be able to provide a reasonable, reliable estimate for the population mean. As of right now, this would apply to people who regularly do these exercises, as the people who self-reported their data probably lean more towards that audience. If there was a larger sample size, I believe the population mean presented in the confidence interval would be more reliable and could apply to a larger audience.

**8.** Why would a hypothesis test not be appropriate given the data that we currently have?

In order to conduct a hypothesis test, we would need another metric to test our hypothesis against (the null hypothesis). Since we only have the data that was reported, we don’t have another measure to compare against and therefore can’t conduct a hypothesis test.

1. Reddit Thread: <https://www.reddit.com/r/Fitness/comments/35q4i3/how_much_do_you_dumbbell_flat_bench_compared_to/> [↑](#footnote-ref-1)