Practical Work 02

Distribution Shapes: Skewness

Analyzing Asymmetry in Biological Data

1. Understanding Skewness

Skewness is a measure of the asymmetry of the data distribution around its mean.

- **Symmetric (Zero Skew):** The left and right sides are mirror images. Mean $\approx$ Median.
- **Right-Skewed (Positive Skew):** The "tail" on the right side is longer. Mean > Median.
- **Left-Skewed (Negative Skew):** The "tail" on the left side is longer. Mean < Median.

2. SPSS Procedure to Calculate Skewness

To find the Skewness value and visualize the shape:

1. Go to **Analyze** > **Descriptive Statistics** > **Frequencies**.
2. Move your variable to the **Variable(s)** box.
3. Click **Statistics** and check **Skewness** (under the "Distribution" section).
4. Click **Charts**, select **Histograms**, and check **Show normal curve**.

3. Exercises: Data Entry and Analysis

Perform the following three exercises. For each, create a new variable in SPSS, enter the data, and generate the Histogram with the Skewness value.

3.1 Exercise 1:

A researcher measures the length (cm) of 10 leaves from a healthy plant.
Data: 12, 13, 13, 14, 14, 14, 14, 15, 15, 16.

3.1.1 Solution:

1. Let's begin by enter the data using frequency.
2. To read the frequencies use **DATA==>weight cases**.
3. Go to **Analyze ==> Descriptive Statistics ==>** enter **height** on the variable case, then select **Statistics** (see the screen shots).
4. Select **Charts ==> Bar Chart**

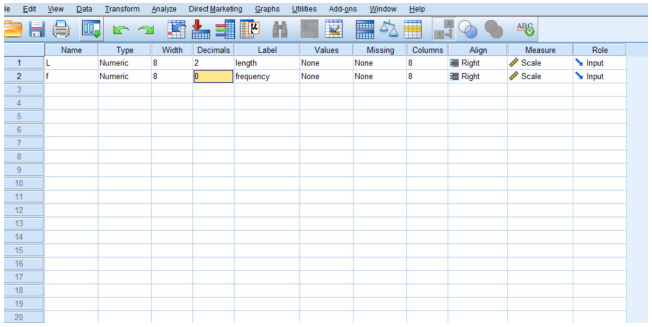

Figure 1: First Step

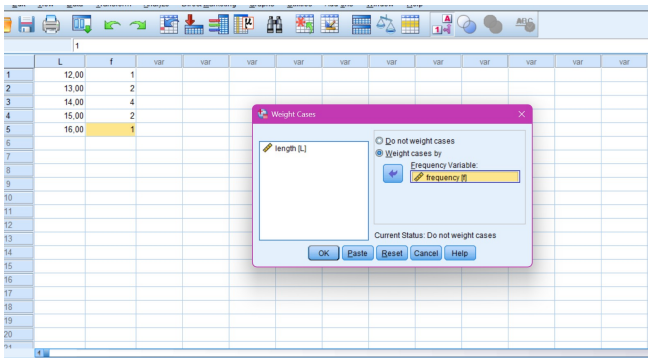

Figure 2: Second Step

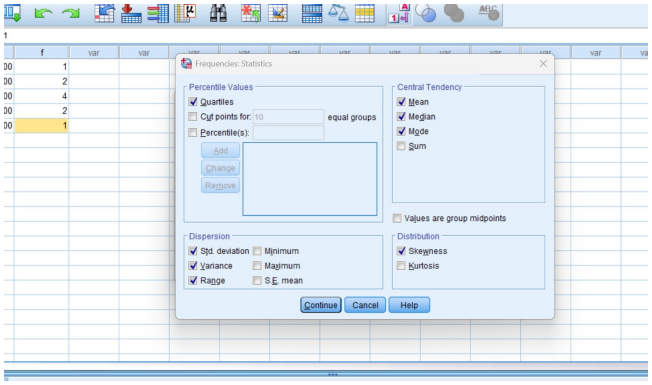

Figure 3: Third Step

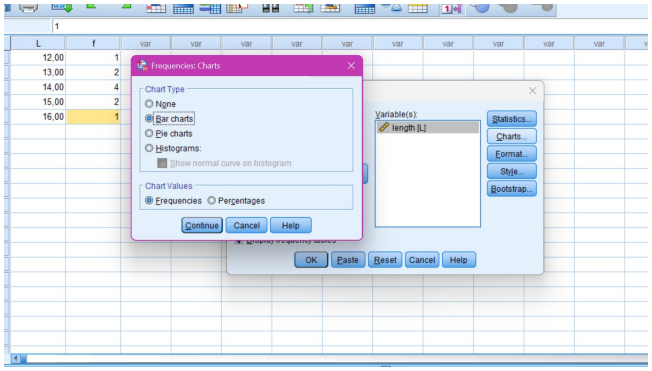

Figure 4: Fourth Step

5. Press **ok**.

6. Using the bar chart we can't see the normal curve so we will use the histogram and select

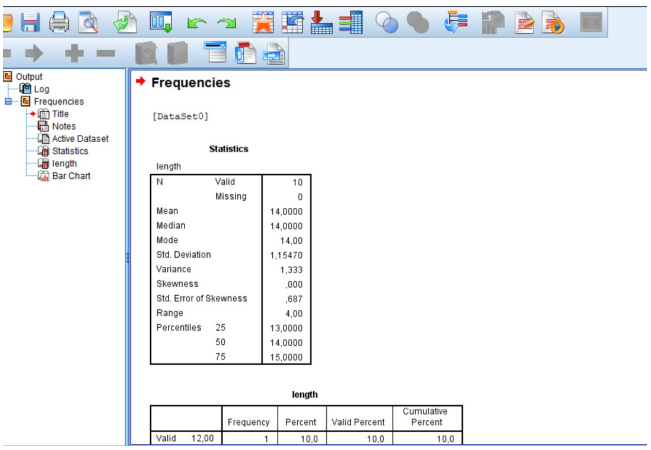

Figure 5: Results

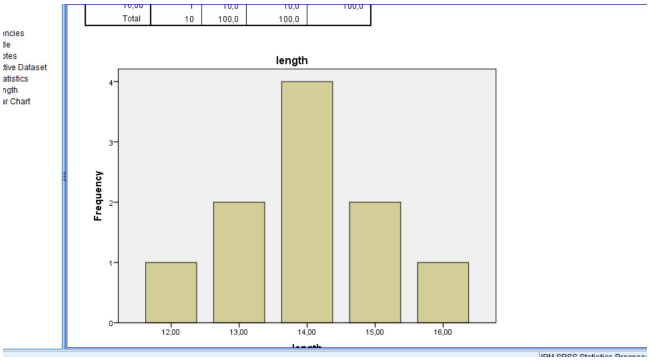

Figure 6: Results

the normal curve.

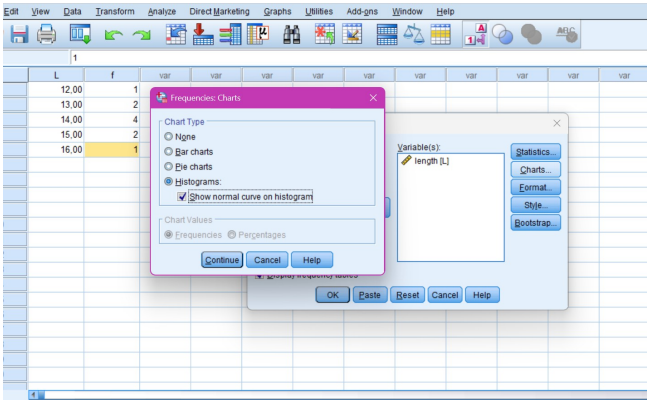

Figure 7: Sixth Step

As we see in the table the skewness = 0, and the mean = the mode = the median, so this distribution is **symmetric**.

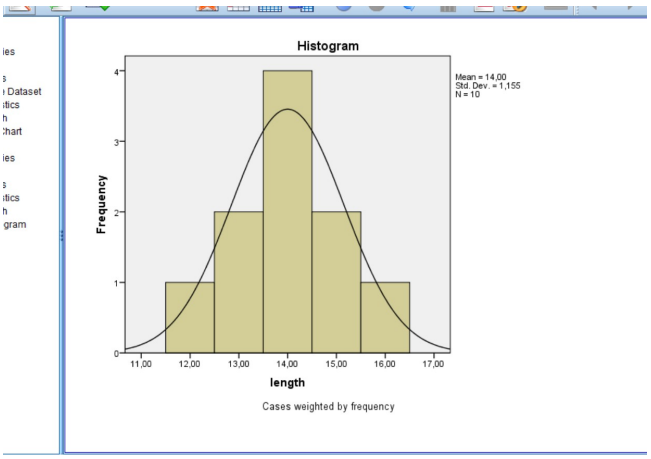

Figure 8: Normal Curve

3.2 Exercise 2:

Counting the number of parasites per fish in a pond. Most fish have very few, but a few fish are heavily infected.
Data: 0, 1, 1, 1, 2, 2, 3, 8, 15, 20.

3.3 Solution:

Using same steps as the first exercise.

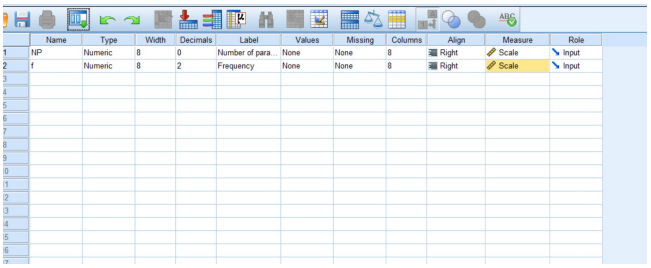

Figure 9: Step 01

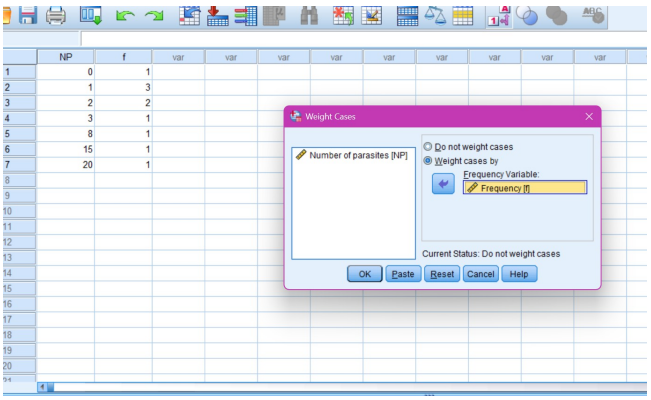

Figure 10: Step 02

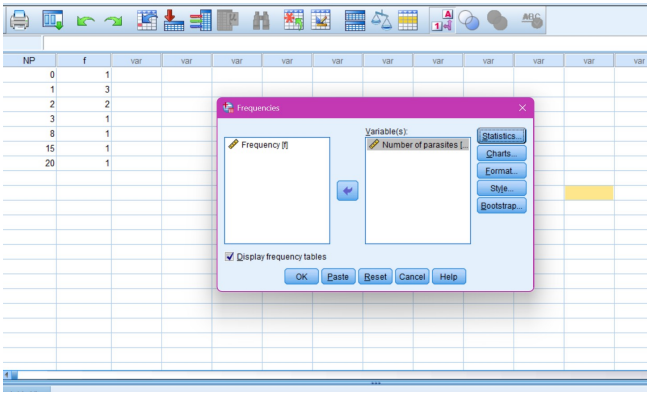

Figure 11: Step 03

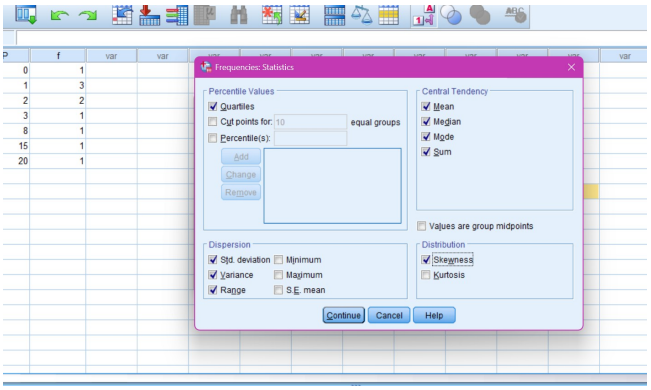

Figure 12: Step 04

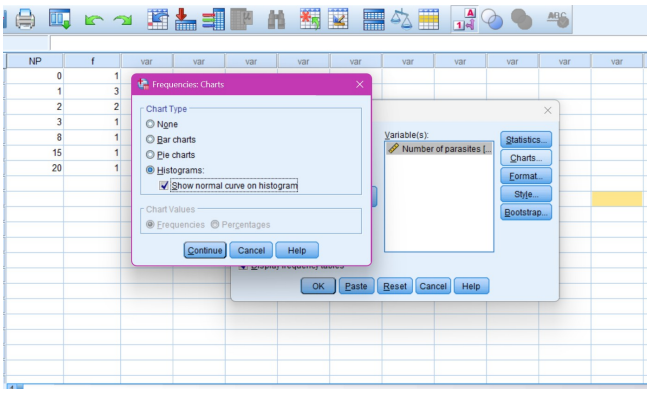

Figure 13: Step 05

3.3.1 Conclusion:

The "tail" extends to the right. Skewness value is **Positive** (> 0).

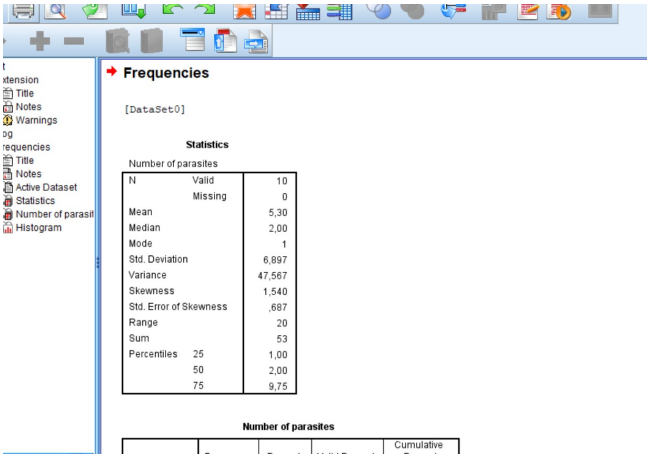

Figure 14: Results

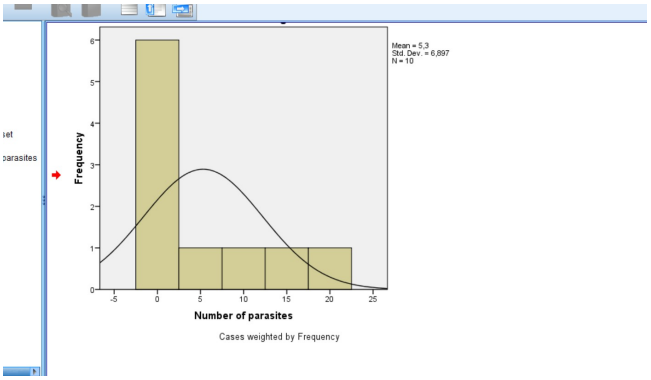

Figure 15: Results

3.4 Exercise 3:

Scores on an extremely easy biology quiz (out of 20). Most students scored very high, but a few struggled.
Data: 5, 8, 15, 18, 19, 19, 20, 20, 20, 20.

3.4.1 Solution:

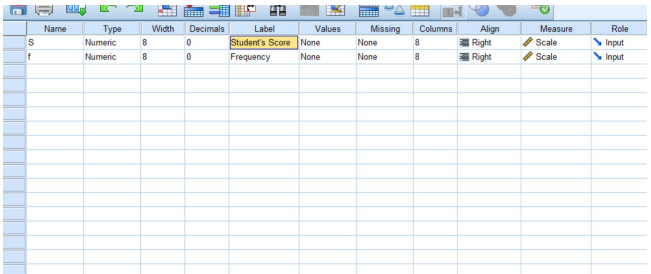

Figure 16: Step 01

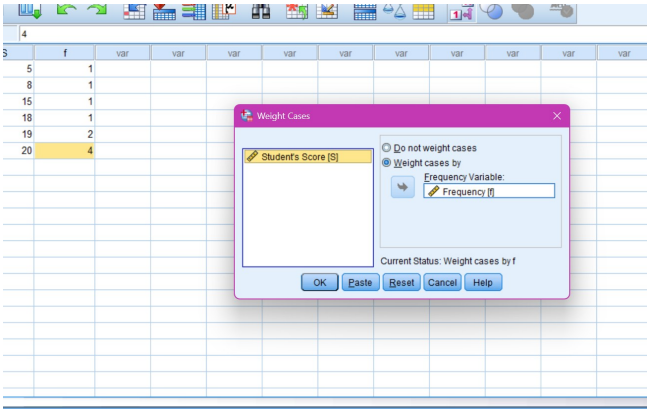

Figure 17: Step 02

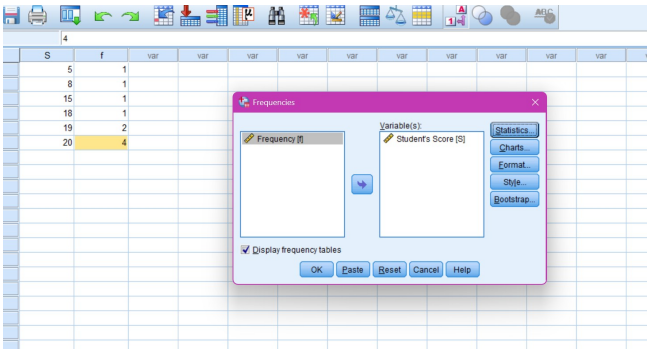

Figure 18: Step 03

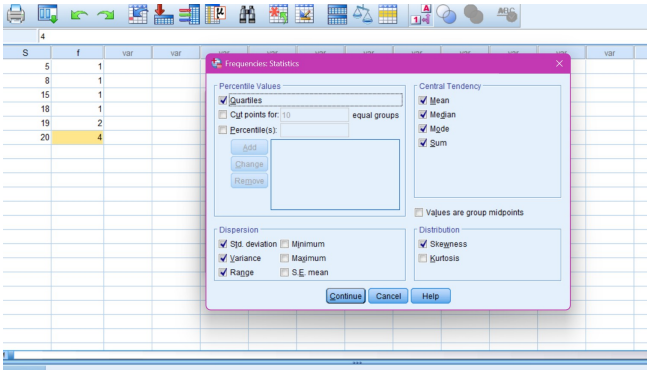

Figure 19: Step 04

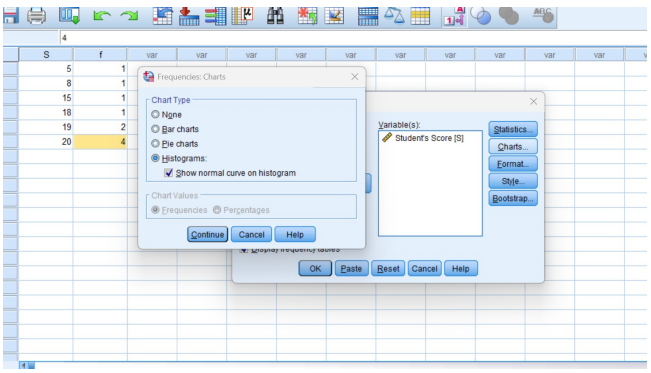

Figure 20: Step 05

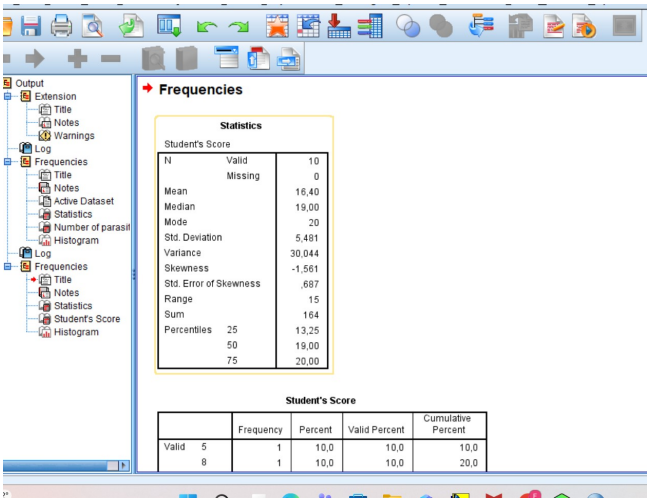

Figure 21: Results

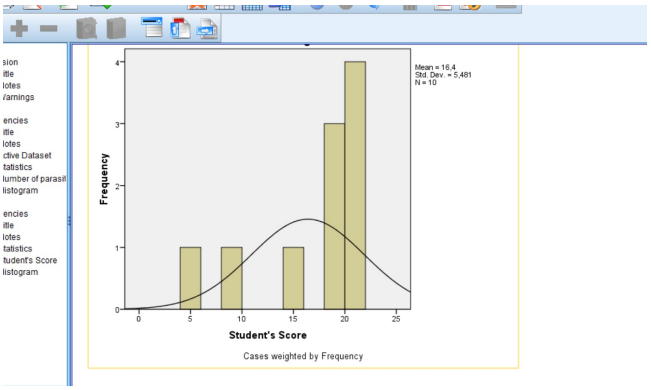

Figure 22: Results

3.4.2 Conclusion:

The "tail" extends to the left. Skewness value is **Negative** (< 0).

— End of Practical Work 02 —