Standard Deviation

The Standard Deviation (σ) is a way to measure how spread out the variables are in a data set. In other words, it is the average distance a variable is from the mean. The standard deviation is the square root of the variance.

In order to calculate the standard deviation by hand, follow these steps:

1. Find the mean of the distribution of raw scores:
   \[ \mu = \frac{\sum X}{N} \]

2. Calculate the deviation scores:
   \[ x = X - \mu \]

3. Square each deviation score to eliminate negative signs and then add them together (to get Sum of Squares – SS):
   \[ SS = \sum x^2 \]

4. Divide the SS by N (to get variance – \( \sigma^2 \)):
   \[ \sigma^2 = \frac{SS}{N} \]

5. Take the square root of the variance (to get SD – \( \sigma \)).
   \[ \sigma = \sqrt{\sigma^2} \]

Some professors might ask you to use the following formula instead (Note: This formula incorporates degrees of freedom into the calculation and is more appropriate and more accurate to use when you are working with a smaller sample instead of a population. It is also the formula that SPSS uses when it calculates the standard deviation.):

- Formula:
  \[ \sigma = \sqrt{\frac{\sum X^2 - (\sum X)^2}{N-1}} \]
In order to calculate the standard deviation in SPSS, follow these steps:

1. Open the data set.
2. Click on “Analyze.”
3. Click on “Frequencies.”
4. Click on “Descriptive Statistics.”
5. Move the variable that you wish to analyze from the left box into the right box.
6. Click the box that says “statistics” on the right. Tick the box for standard deviation. Click the Continue box at the bottom.

7. Click the OK box.
8. The output sheet that is generated will contain the standard deviation.

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<table>
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</thead>
<tbody>
<tr>
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<tr>
<td>Std. Deviation</td>
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