Lesson Two :Descriptive Statistics: Measures Dispersion

Measures of dispersion describe how spread out the scores in a data set are; that is, how far scores vary and differ from one another. Two common measures of dispersion are : the **range** and the **standard deviation**.

Key terms

Measures of dispersion A descriptive statistic that provides information about how spreadout a set of data are

Range – A simple calculation of the dispersion in a set of scores which is worked out by subtracting the lowest score from the highest score and adding 1 as a mathematical correction.

Standard deviation – A sophisticated measure of dispersion in a set of scores. It tells us how much scores deviate from the mean by calculating the difference between the mean and each score. All the differences are added up and divided by the number of scores. This gives the variance. The standard deviation is the square root of the variance.

Range

The range is a simple way to measure the spread of scores. It is calculated by subtracting the lowest value from the highest value, often with an addition of 1 as a small correction. For example, for the data set below, the range is: (17 - 5) + 1 = 13.

The addition of 1 accounts for the fact that raw scores are often rounded. For instance, a task might be recorded as taking 45 seconds, but the actual time could have been anywhere between 44.5 and 45.5 seconds.

The range is easy to compute, but it only considers the two most extreme values, which can sometimes misrepresent the overall data. For example, consider the following test scores of a math class: 0, 47, 49, 50, 50, 50, 51, 53, 54, 56, 56, 57, 100
The range here is 101, but this is misleading because one student scored 0 due to illness, and another scored 100 due to a mistake. Most students scored around 50, so a more epresentative measure of spread would give a range of 11.

Standard deviation

A more advanced and precise measure of dispersion is the **standard deviation**, which indicates how far the scores deviate from the mean.

- A **large standard deviation** shows that the data are widely spread, suggesting that participants' responses vary considerably. There may also be a few outliers affecting the spread.
- A **small standard deviation** indicates that the scores are clustered closely around the mean, implying that participants responded in a relatively consistent way.

Unlike the range, the standard deviation takes into account all values in the data set, making it a more accurate measure of dispersion. However, similar to the mean, it can still be influenced by extreme values.

Methods: Drawing conclusions from a table of results

The table below includes a summary of the results gained from an experiment. The experiment compared the number of words recalled when words were learned in silence compared to when words were learned whilst music was playing in the background.

Table shows the means and standard deviations for the number of words recalled when learned in silence and when learned with music playing

Condition A (learned in silence)	Condition B (learned with music playing)	
Mean number ofwords recalled	21.2	14.6
Standard deviation	1.1	4.6

Questions

1. What conclusion can be drawn from the **mean** values above? (*2 marks*)
2. What do the **standard deviations** tell us about the scores in each condition? (*2 marks*)