**Learning Goal:** For the distribution of a quantitative variable, describe the overall pattern (shape, center, and spread) and striking deviations from the pattern.

Specific Learning Objective: Use the mean and standard deviation to create intervals of typical measurements.

When we compare two distributions, we want to describe an interval of typical data values. If we use the median as an average, we can use Q1 to Q3 to give an interval of typical data values. If we use the mean as an average, we can use the interval within one SD of the mean: (mean – SD, mean + SD).

Example: Here we have data on shoulder girth measurements for 247 men and 260 women who exercise regularly.

1) For this sample of men and women, would you argue that men tend to have shoulder girths that are larger than women? Why or why not?
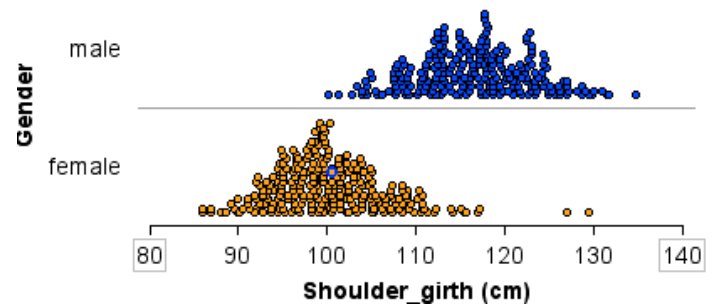
2) The mean shoulder girth for men is 116.5 cm vs. 100.3 cm for women. This tells us that on average men have larger shoulders. But there is variability in the data. To take variability into account, we can give an interval of typical measurements for each gender, instead of relying on a comparison of just the mean.

   Typical men have shoulder measurements within one standard deviation of the mean. The standard deviation for men is 6.5 cm.

   Mean – SD = 116.5 – 6.5 = 110
   Mean + SD = 116.5 + 6.5 = 123
   Based on this data, typical men have a shoulder girth between 110 and 123 cm.

   The standard deviation in women's shoulder girths is also 6.5cm. Find an interval of typical shoulder measurements for women using the mean and SD:

3) Do the intervals of typical measurements overlap? How does this observation support your answer to (1)?

4) Tinkerplots uses the mean and standard deviation (and the min and max) to draw a Standard Deviation Hat Plot.

-1.00 to 1.00 Standard Deviation Hat Plot of Shoulder_girth (cm)

a) Label the mean and the standard deviation in the female distribution.

b) Describe how to draw a Standard Deviation Hat Plot.
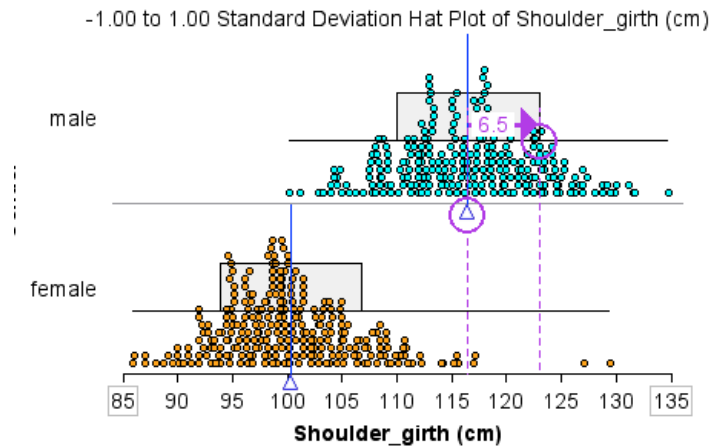
c) What part of the hat plot represents typical measurements?

Group work:

5) The people in this sample are 18 to 67 years old. Here is a summary of the distribution of ages: Mean = 30, SD = 9.6; 5-number summary: 18, 23, 27, 36, 67

a) Give an interval of typical ages for this sample using quartiles.

b) Give an interval of typical ages for this sample using mean and SD.

c) Here is a boxplot and a standard deviation hat plot for this age distribution. In the boxplot label the median and other quartiles. In the standard deviation hat plot label the mean and SD.
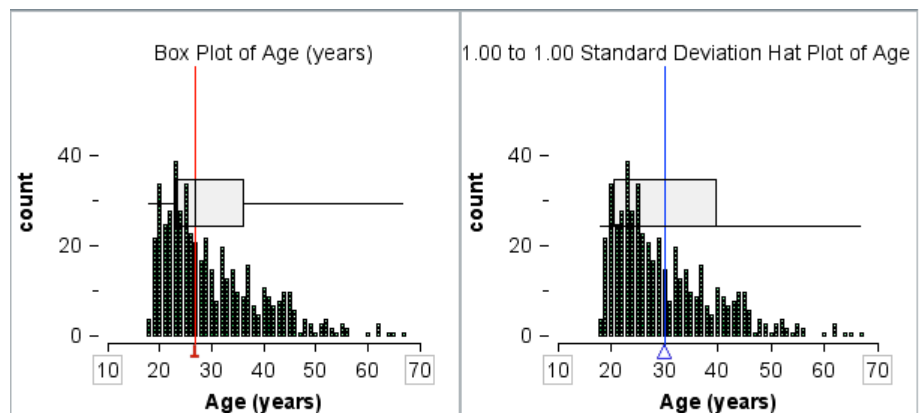
d) The median is not in the center of the box in the boxplot, but the mean is in the center of the standard deviation hat plot. Will the mean always be in the center of a standard deviation hat plot? Why or why not?
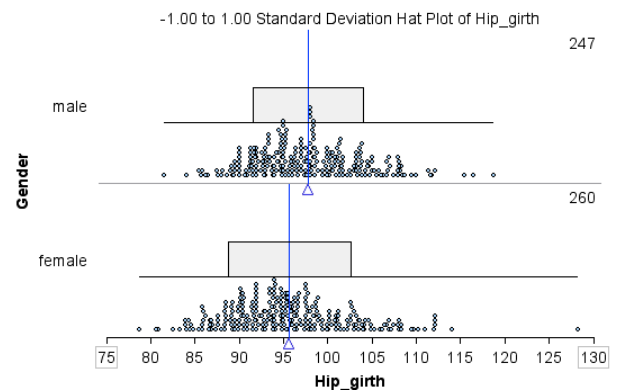
6) Hip girth is the distance around the widest part of the hips, given in centimeters.

a) For this sample, do you think men's hip measurements tend to be (larger, smaller, or about the same) as women's hip measurements? Why?

male

female

70   80   90   100   110   120   130
Hip_girth (cm)
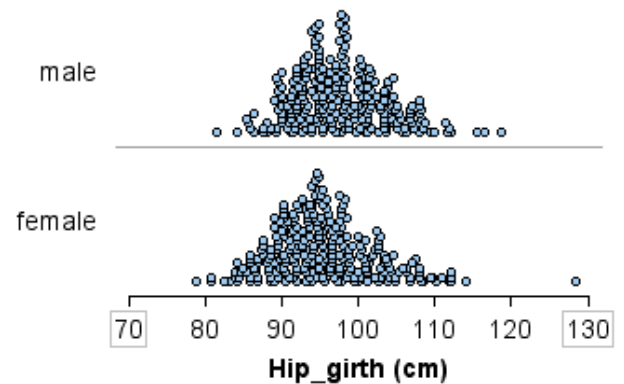
b) Calculate an interval of typical measurements using the mean and the standard deviation (mean ± SD) for males and females. These intervals are represented by the rectangle in the Standard Deviation Hat Plot.

Gender	Mean	SD
Male	97.8 cm	6.2 cm
Female	95.7 cm	6.9 cm

-1.00 to 1.00 Standard Deviation Hat Plot of Hip_girth

247

male

Gender

260

female

75   80   85   90   95   100   105   110   115   120   125   130
Hip_girth

c) Do men tend to have larger hips than women? Use descriptions of shape, center (mean), and spread (SD) to support your choice. Incorporate your intervals of typical measurements from part (b), too.