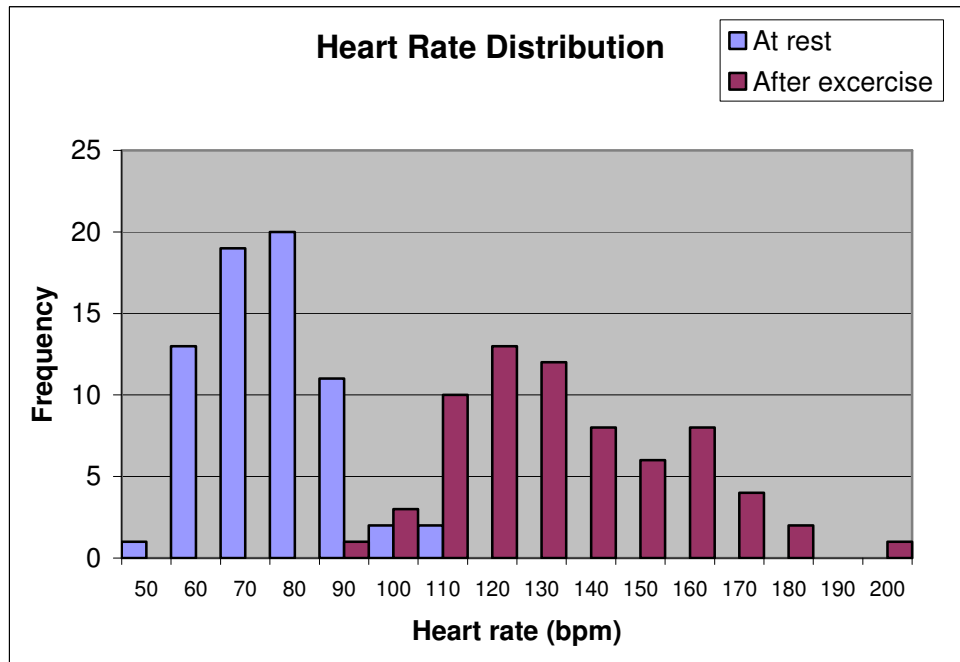


## Heart Rates

This experiment was conducted to compare the heart rate of students in INS before and after exercise. Students recorded their heart rate in beats per minute at rest and then ran around the lecture hall and recorded their heart rate again immediately afterwards. The following histogram illustrates the results:



The distribution of both sets of data is approximately normal (ie it follows a bell curve), with the at-rest values being lower and less widely spread than the after-exercise values.

For a quantitative comparison we first compute the measures of central tendency. For the at-rest values the mean, mode and median were, 73, 60, 71.5 bpm respectively, and for the after-exercise values the mean, mode and median were 131, 140 and 127 bpm respectively. All of these values went up significantly, indicating the typical heart rate of an INS student after exercise goes up. This is the expected result, since the heart needs to pump faster to supply oxygen to the muscles that do the work.

For a measure of spread we calculate the standard deviation. For the at-rest values the standard deviation is 11.2 bpm whereas for the after-exercise values the standard deviation is 23.9 bpm. Both of these values are large compared with their respective means – indicating that people have a wide range in values for their heart rates. This effect is particularly pronounced for the case of heart rates after exercise. The large spread for the after exercise values is probably a reflection of the fact that the fitness of INS students varies considerably. It could also be due to the fact that not all students ran the same distance or at the same level of exertion. Another factor that could lead to a large standard deviation is the variety of methods students used for measuring pulse.

In conclusion, the data showed that heart rates have a tendency to increase after exercise and also the values of heart rate tend to be spread more widely. To reduce sources of error in a future experiment it might help to have one person record all the heart rates, and to have another person monitoring the exercise regime to ensure consistency.

