Exercise 7

In this exercise, you wanted to examine whether there are differences in the average heart rate for different levels of the Speed factor. Your problem is a hypothesis test for the equality of means between two populations. Since the measurements for both methods were taken from the same experimental units, you conclude that your samples are dependent. This is a "Before-After" experiment. To answer your initial question, you should form the differences in heart rates before and after exercise, transforming your problem into a one-population mean test. Specifically, you are testing whether the mean of the difference in heart rates before and after exercise is equal to zero.

To use the t-test for a single population, you should satisfy the following assumptions for your sample:

1. The sample should be random.
2. It should not contain extreme values (outliers) beyond 10% of the data.
3. The sample should come from a population that can be adequately described by a normal distribution.

Based on the histogram (boxplot) you provided, it appears that there are no extreme outliers in the sample values of the differences in heart rates before and after exercise (see boxplot 1).

Next, you checked if the 30 sample observations of the difference in heart rates before and after exercise are from a normally distributed population. The critical probability of the Shapiro-Wilk test is p-value=0.169, which means that you cannot reject the assumption of normality at a 5% significance level.

As a conclusion from implementing the t-test, it is evident that the heart rates before and after exercise differ significantly (p-value<0.001). More specifically, on average, heart rates after exercise are 26.9 beats per minute higher than before exercise.

Boxplot 1

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