Assignment 9

You are interested in causes and treatment options for Psychopathy. You obtained a dataset from someone who studies psychopathy who logged the data in a prison for violent offenders in upstate New York. Not everyone in prison is a psychopath, but they are overrepresented in prison. This dataset is contained in the file 'psychopathy.mat', which can be downloaded from the website. Each row represents data from one prisoner. The first column represents the cortical volume of paralimbic areas, relative to the population median, in cm^3. All study participants underwent a structural scan with a mobile, truck-mounted MRI. The second column represents PCL-R scores – the higher the score, the more psychopathic traits someone exhibits. Scores on this scale range from 0 to 40 and you know that these scores are not distributed normally in the general population (median = 4) and definitely not normal in this subpopulation (median = 20). The third column represents whether they already participated in an experimental program – "decompression therapy" to treat Psychopathy (0 = did not yet participate, 1 = did already participate). Importantly – to avoid self-selection effects – everyone in this dataset agreed to the therapy, but prisoners were randomly assigned to an earlier and a later treatment group, so that the untreated prisoners could serve as a control group.

Write code that does the following:

1) Use bootstrapping methods to estimate the 95% confidence interval of the average paralimbic volume of the decompression treatment group vs. the control group. If the random assignment worked, the confidence intervals should overlap. Do they? Also, does this data suggests that there is a statistically reliable difference to the general population in terms of paralimbic volume?
2) Do a suitable t-test to compare the mean PCL-R score of prisoners who did and did not undergo decompression therapy. What is the p-value? Assuming an alpha-level of 0.05, is this difference significant? Can you reject the null hypothesis that decompression therapy is ineffective in terms of decreasing PCL-R scores?
3) Do a permutation test to assess whether decompression therapy has an effect. Designate an appropriate test statistic and calculate its exact p value.