Exam 2011 Problem 2

The data in this exercise are taken from I.T. Jolliffe: Principal Component Analysis, 2nd ed., Springer 2002. The 10 variables analyzed give the strength of the reflexes for the right and left triceps (TriR, TriL), biceps (BicR, BicL), wrist (WriR, WriL), knee (KneR, KneL), and ankle (AnkR, AnkL). The biceps and triceps are muscles in the upper arm. Based on measurements on 143 persons the correlations between the different variables were found, and they form the basis for the following questions. The correlations are found in the dataset reflexes.cor.csv.

In contrast to the original problem, you are supposed to generate the relevant output yourself from the techniques used on the slides.

Question 2.1.

Consider the correlation matrix. The number of principal components needed to account for at least 90% of the total variation is:

1 ☐ 1

2 ☐ 2

3 ☐ 3

4 ☐ 4

5 ☐ 5

6 ☐ Don"t know.

Question 2.2.

The ususal test statistic for testing whether the smallest 7 eigenvalues of the correlation matrix may be assumed to be equal has the following degrees of freedom

1 ☐ 142

2 ☐ 140

3 ☐ 71

4 ☐ 27

5 ☐ 17

6 ☐ Don’t know.

Question 2.3.

The principle component that best expresses the difference between the reflexes in the left and the right ankle is no.:

1 ☐ 2

2 ☐ 4

3 ☐ 6

4 ☐ 8

5 ☐ 10

6 ☐ Don't know.

Question 2.4.

If we consider the initial 3-factor model, the amount of variation in the left ankle reflex that is explained by the 3 factors is:

1 ☐ 2.035

2 ☐ 0.78

3 ☐ 0.97

4 ☐ 0.43

5 ☐ 0.42

6 ☐ Don't know.

Question 2.5.

The maximal correlation between the right wrist reflex and a rotated factor is

1 ☐ 0.7450

2 ☐ 0.6800

3 ☐ 0.3405

4 ☐ 0.6679

5 ☐ 0.8575

6 ☐ Don't know.

Question 2.6.

Which of the following statements is true?

1 ☐ Rotated factor 1 is mainly an average of the arm reflexes, rotated factor 2 the average of the knee reflexes, and rotated factor 3 the average of the ankle reflexes.

2 ☐ Unrotated factor 1 is basically the overall average, unrotated factor 2 is a contrast between the arm and the leg reflexes, and unrotated factor 3 is the average ankle reflex.

3 ☐ Rotated factor 1 is basically the overall average, rotated factor 2 is a contrast between knee and ankle reflexes, and rotated factor 3 is the average of the ankle reflexes.

4 ☐ The unrotated factor 3 show the differences between the left and the right reflex

measurements.

5 ☐ Unrotated factor 1 is an overall average, unrotated factor 2 is the average leg reflex, and unrotated factor 3 is a contrast between the leg and the arm reflexes.

6 ☐ Don't know.