Institute of Systems Science

National University of Singapore

GRADUATE CERTIFICATE

BUSINESS ANALYTICS PRACTICE

Supplementary Workshop Guide

Subject: *NICF- Statistics Bootcamp*

Workshop 2.6

Background

Dry eye is a common disease with great health burden and no satisfactory treatment. There was a clinical study that looked into the use of Traditional Chinese Medicine (TCM) as one of the possible ways to control and manage dry eye. The study had recruited 50 dry eye subjects. Before the start of the treatment, they were assessed on their conjunctival redness. Four weeks later, they were asked to visit the clinic and did another evaluation on their conjunctival redness.

Table 1: Conjunctival redness of the 100 subjects

No treatment *(before)*		**Herb** *(after)*	
2.372	1.264	1.477	0.875
1.957	0.330	1.323	1.322
1.997	2.074	0.967	0.909
2.087	1.618	1.349	0.985
1.815	0.905	1.270	0.789
1.403	1.951	1.076	1.014
0.847	1.395	0.712	0.954
1.632	0.882	0.858	0.871
0.514	0.501	0.919	0.569
1.501	1.351	0.866	1.242
1.782	0.835	1.274	0.861
0.989	0.856	1.140	1.190
1.358	0.463	1.138	1.720
1.392	0.970	1.091	1.106
1.520	1.671	0.599	0.858
1.282	1.261	1.210	0.826
1.431	2.029	0.948	1.208
1.379	0.801	0.934	0.954
0.672	1.028	1.020	0.123
1.565	1.396	1.633	1.520
1.438	1.576	0.737	0.816
1.043	1.300	0.750	0.608
0.932	0.245	0.996	0.768
2.216	0.836	0.962	1.256
1.192	1.303	1.107	1.092

Task

The purpose of the study was to evaluate the effectiveness of the TCM herb treatment.

a. Read in the data from the csv file.
b. Use ggplot to draw boxplot on the conjunctival redness before herb treatment.
c. Use ggplot to draw boxplot on the conjunctival redness after herb treatment.
d. Check the normality of the notreat sample.
e. Check the normality of the herb sample.
f. Check the normality of the difference between notreat and herb sample.
g. Perform the correct *t*-test to determine if there was a significant change in conjunctival redness after herb treatment

Solutions

a. Read in the data from the csv file.

```
study = read.csv("DryEye.csv")
```

b. Use `ggplot` to draw boxplot on the conjunctival redness before herb treatment.

```
library(ggplot2)
ggplot(study,aes("",notreat)) + geom_boxplot()
```

c. Use `ggplot` to draw boxplot on the conjunctival redness after herb treatment.

```
library(ggplot2)
ggplot(study,aes("",herb)) + geom_boxplot()
```

d. Check the normality of the `notreat` sample.

```
shapiro.test(study$notreat)
```

```
##
##       Shapiro-Wilk normality test
##
## data:  study$notreat
## W = 0.98351, p-value = 0.7062
```

e. Check the normality of the `herb` sample.

```
shapiro.test(study$herb)
```

```
##       Shapiro-Wilk normality test
##
## data:  study$herb
## W = 0.97509, p-value = 0.3678
```

f. Check the normality of the difference between `notreat` and `herb` sample.

```
diff = study$herb - study$notreat
shapiro.test(diff)
```

```
##     Shapiro-Wilk normality test
##
## data:  diff
## W = 0.97144, p-value = 0.2646
```

g. Perform the correct *t*-test to determine if there was a significant change in conjunctival redness after herb treatment

```
t.test(study$notreat,study$herb,paired=TRUE)
```

```
##       Paired t-test
##
## data:  study$notreat and study$herb
## t = 3.8141, df = 49, p-value = 0.0003833
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  0.1359237 0.4386641
## sample estimates:
## mean of the differences
##               0.2872939
```