Cervical Dystonia

Mohammed Rahman

February 8, 2020

```
#Loading Libraries
library(haven)
library(data.table)
library(tidyverse)
library(skimr)
library(gridExtra)
library(gtsummary)
library(expss)
```

```
#Loading in Data
cerv <- read_dta("cdystonia.dta")

glimpse(cerv)
```

```
## Observations: 631
## Variables: 7
## $ week   <dbl> 0, 2, 4, 8, 12, 16, 0, 2, 4, 8, 12, 16, 0, 2, 4, 8, 12, 16, ...
## $ site   <dbl+lbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,...
## $ id     <dbl> 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, ...
## $ treat  <dbl+lbl> 2, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3,...
## $ age    <dbl> 65, 65, 65, 65, 65, 65, 70, 70, 70, 70, 70, 70, 64, 64, 64, ...
## $ sex    <dbl+lbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,...
## $ twstrs <dbl> 32, 30, 24, 37, 39, 36, 60, 26, 27, 41, 65, 67, 44, 20, 23, ...
```

```
head(cerv)
```

```
## # A tibble: 6 x 7
##    week      site    id     treat   age       sex twstrs
##   <dbl> <dbl+lbl> <dbl> <dbl+lbl> <dbl> <dbl+lbl>  <dbl>
## 1     0     1 [1]     1 2 [5000U]    65     1 [F]     32
## 2     2     1 [1]     1 2 [5000U]    65     1 [F]     30
## 3     4     1 [1]     1 2 [5000U]    65     1 [F]     24
## 4     8     1 [1]     1 2 [5000U]    65     1 [F]     37
## 5    12     1 [1]     1 2 [5000U]    65     1 [F]     39
## 6    16     1 [1]     1 2 [5000U]    65     1 [F]     36
```

```
#Mutating the ID variable to capture the Site Location
cerv_dyst <- cerv %>%
             mutate(id = paste0(site, id)) %>%
             select(-site)
```

```
glimpse(cerv_dyst)
```

```
## Observations: 631
## Variables: 6
## $ week   <dbl> 0, 2, 4, 8, 12, 16, 0, 2, 4, 8, 12, 16, 0, 2, 4, 8, 12, 16, ...
## $ id     <chr> "11", "11", "11", "11", "11", "11", "12", "12", "12", "12", ...
## $ treat  <dbl+lbl> 2, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3,...
## $ age    <dbl> 65, 65, 65, 65, 65, 65, 70, 70, 70, 70, 70, 70, 64, 64, 64, ...
## $ sex    <dbl+lbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,...
## $ twstrs <dbl> 32, 30, 24, 37, 39, 36, 60, 26, 27, 41, 65, 67, 44, 20, 23, ...
```

```
#Mutating the sex variable to numeric, Female = 1
cerv_dyst <- cerv_dyst %>%
             mutate(sex = as.numeric(sex)) %>%
             apply_labels(treat = "Treatment", sex = "Sex")
```

Exploratory Analysis

```
#Table recoding
table_cerv <- cerv_dyst %>%
              mutate(
                sex = if_else(sex == 1, "Female", "Male"),
                treat = if_else(treat == 1, "10000U", if_else(
                  treat == 2,"5000U","Placebo")),
                week = paste0("Week ",week),
                week = factor(week, levels = c("Week 0",
                                               "Week 2",
                                               "Week 4",
                                               "Week 8",
                                               "Week 12",
                                               "Week 16")))
#Summary Table by Gender, Week, Treatment
table_cerv %>%
  select(-id, -week, -treat) %>%
  as.data.frame() %>%
  tbl_summary(by = sex) %>%
  add_p() %>%
  bold_p()
```

Characteristic	**Female**, N = 395[1]	**Male**, N = 236[1]	**p-value**[2]
Age [years]	54 (47, 65)	57 (43, 66)	0.9
TWSTRS-total score	44 (34, 52)	40 (31, 50)	0.012

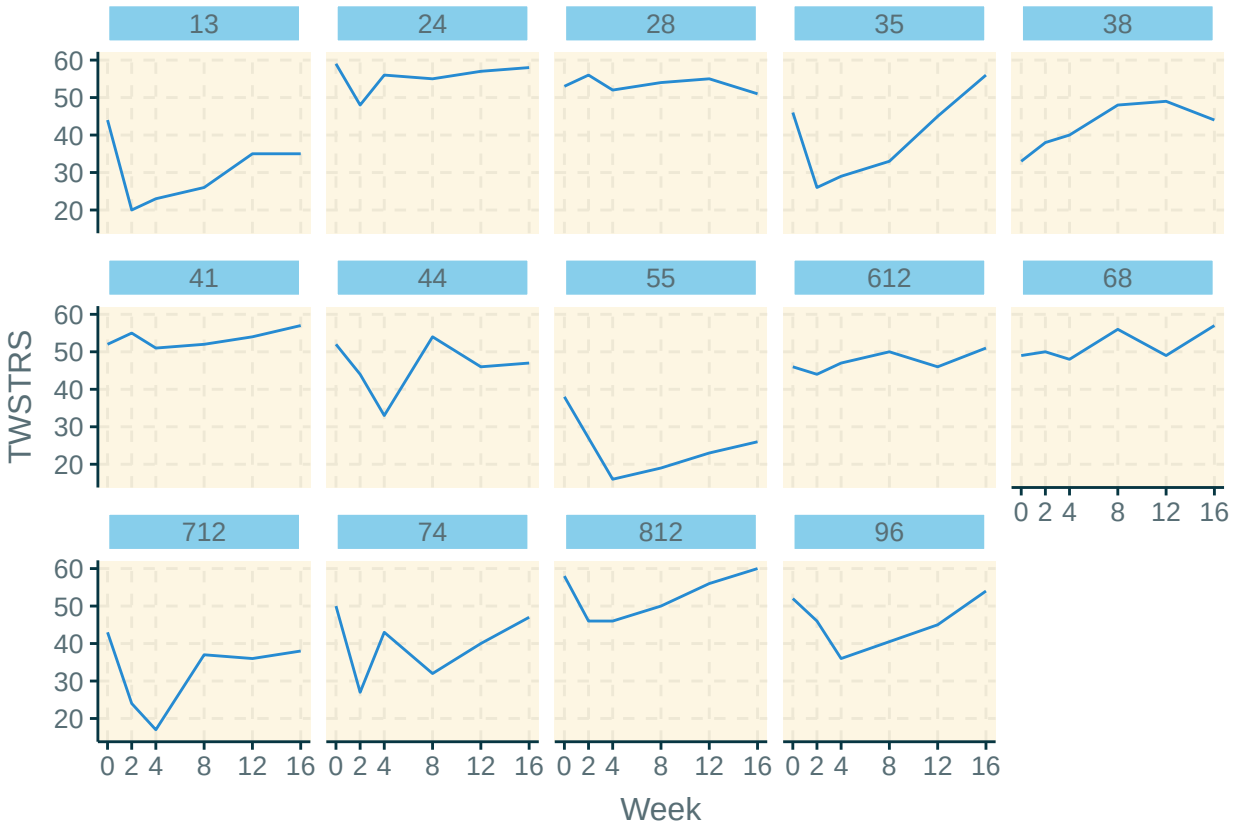
[1]Statistics presented: median (IQR)
[2]Statistical tests performed: Wilcoxon rank-sum test

```r
table_cerv %>%
  select(-id, -sex, -week, -age) %>%
  as.data.frame() %>%
  tbl_summary(by = treat) %>%
  add_p() %>%
  bold_p()
```

Characteristic	**10000U**, N = 213[1]	**5000U**, N = 211[1]	**Placebo**, N = 207[1]	**p-value**[2]
TWSTRS-total score	44 (33, 51)	43 (32, 51)	43 (33, 50)	>0.9

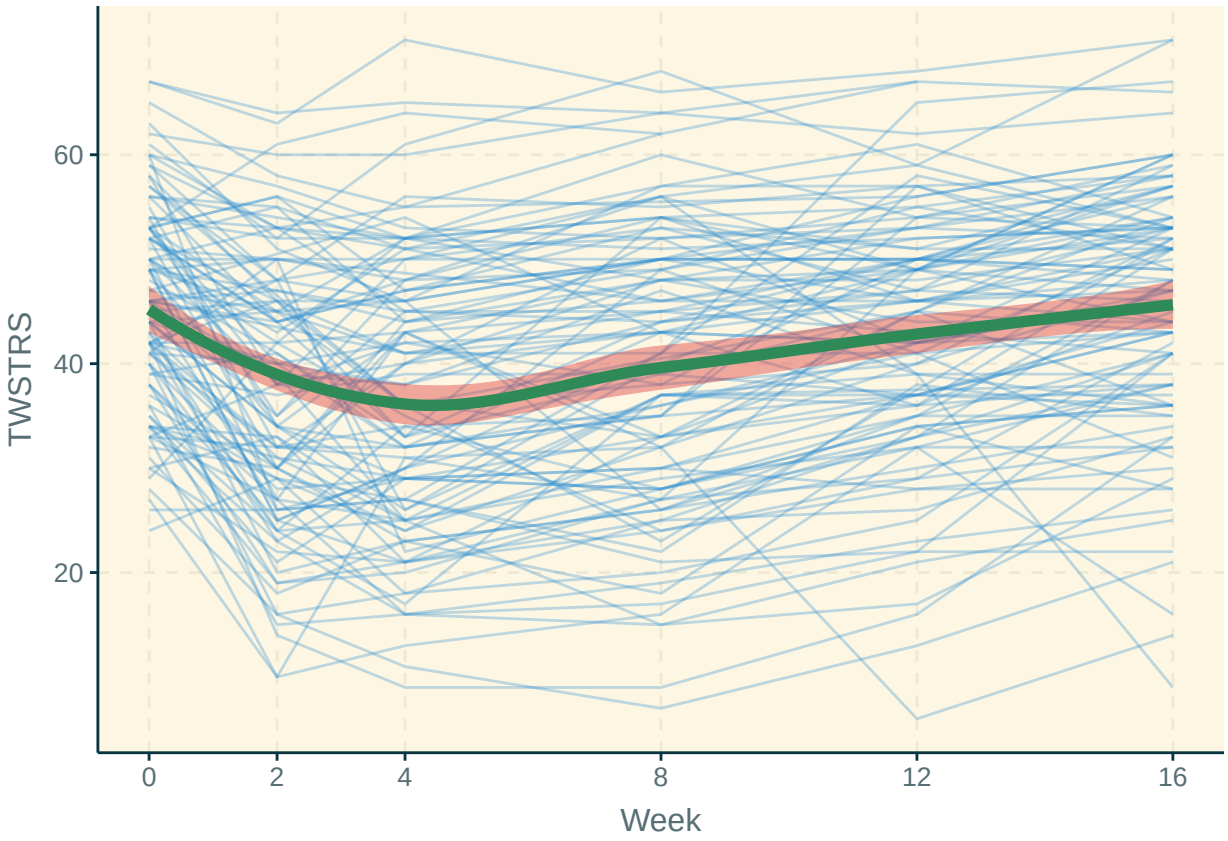
[1]Statistics presented: median (IQR)
[2]Statistical tests performed: Kruskal-Wallis test

```r
#Histogram of Age and Rating Scales
age_hist <- ggplot(data = cerv_dyst, aes(x = age)) +
            geom_histogram(col = "white", fill = "seagreen3")

twstrs_hist <- ggplot(data = cerv_dyst, aes(x = twstrs)) +
               geom_histogram(col = "white", fill = "seagreen3") +
               labs(x = "Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS)")

set.seed(123)
id_sample <- sample(cerv_dyst$id, 15)

# Plots of 15 random sample individuals
ggplot(data = cerv_dyst %>% filter(id %in% id_sample),
       aes(x = week, y = twstrs)) +
  geom_line() +
  facet_wrap(~id, ncol = 5) +
  theme(strip.background = element_rect(colour="white",
                                        fill="skyblue",
                                        size=4,
                                        linetype="solid")) +
  scale_x_continuous(breaks = c(0, 2, 4, 8, 12, 16)) +
  labs(x = "Week",
       y = "TWSTRS")
```




```
# Every individual's change through the weeks with average
ggplot(data = cerv_dyst, aes(x = week, y = twstrs)) +
  geom_line(alpha=0.3, aes(group = id)) +
  geom_smooth(col = "seagreen4", size = 2) +
  scale_x_continuous(breaks = c(0, 2, 4, 8, 12, 16)) +
  labs(x = "Week",
       y = "TWSTRS")
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```


TWSTRS
60
40
20
0
2
4
8
12
16
Week