Lecture 15
Segment 2

t-tests in R

Goal

- Write a script in R
  - Dependent t
  - Independent t

To illustrate dependent t

- Write a script in R
  - IV: Pre and post
  - DV: Score

To illustrate independent t

- Write a script in R
  - IV: Training group (control, training)
  - DV: Gain

Read data and print descriptives

```
# Read the data into R
wm = read.table("STATS1.EX.07.txt", header = T)

# Print descriptive statistics for the variables in wm by training condition (cond)
describe.by(wm, wm$cond)
```

Descriptive statistics

```
group: control
        var  n   mean   sd median trimmed  mad min max range  skew kurtosis   se
cond*    1 40   1.00 0.00      1    1.00 0.00   1   1     0   NaN      NaN 0.00
pre      2 40   9.97 1.46     10    9.97 1.48   8  12     4  0.09    -1.41 0.23
post     3 40  11.95 2.06     12   12.00 2.22   7  17    10 -0.05    -0.18 0.33
gain     4 40   1.98 1.39      2    1.97 1.48  -1   5     6  0.10     0.03 0.22
train    5 40   0.00 0.00      0    0.00 0.00   0   0     0   NaN      NaN 0.00
```

Descriptive statistics

```
group: t08
       var  n  mean   sd median trimmed  mad min max range  skew kurtosis   se
cond*    1 20  2.00 0.00    2.0    2.00 0.00   2   2     0   NaN      NaN 0.00
pre      2 20 10.05 1.50   10.0   10.06 1.48   8  12     4  0.01    -1.53 0.34
post     3 20 11.40 2.14   11.5   11.50 2.22   7  15     8 -0.25    -0.84 0.48
gain     4 20  1.35 1.23    1.0    1.44 1.48  -1   3     4 -0.32    -0.82 0.27
train    5 20  1.00 0.00    1.0    1.00 0.00   1   1     0   NaN      NaN 0.00
-----------------------------------------------------------------------------
group: t12
       var  n mean   sd median trimmed  mad min max range skew kurtosis   se
cond*    1 20  3.0 0.00      3    3.00 0.00   3   3     0  NaN      NaN 0.00
pre      2 20  9.9 1.45     10    9.88 1.48   8  12     4 0.16    -1.43 0.32
post     3 20 12.5 1.88     12   12.38 2.22  10  17     7 0.48    -0.54 0.42
gain     4 20  2.6 1.27      2    2.50 0.00   0   5     5 0.44    -0.54 0.28
train    5 20  1.0 0.00      1    1.00 0.00   1   1     0  NaN      NaN 0.00
```

Descriptive statistics

```
group: t17
       var  n mean    sd median trimmed  mad min max range skew kurtosis   se
cond*    1 20   4.0 0.00      4    4.00 0.00   4   4     0  NaN      NaN 0.00
pre      2 20  10.0 1.34     10   10.00 1.48   8  12     4 0.25    -1.34 0.30
post     3 20  14.4 1.85     14   14.25 1.48  12  19     7 0.63    -0.27 0.41
gain     4 20   4.4 1.39      4    4.25 1.48   3   7     4 0.64    -1.12 0.31
train    5 20   1.0 0.00      1    1.00 0.00   1   1     0  NaN      NaN 0.00
------------------------------------------------------------------------------
group: t19
       var  n  mean   sd median trimmed  mad min max range skew kurtosis   se
cond*    1 20  5.00 0.00    5.0    5.00 0.00   5   5     0  NaN      NaN 0.00
pre      2 20 10.15 1.27   10.0   10.19 1.48   8  12     4 0.03    -1.10 0.28
post     3 20 15.75 1.86   16.0   15.69 1.48  13  19     6 0.16    -1.03 0.42
gain     4 20  5.60 1.73    5.5    5.50 2.22   3   9     6 0.36    -0.76 0.39
train    5 20  1.00 0.00    1.0    1.00 0.00   1   1     0  NaN      NaN 0.00
```

Create subsets

```
# Create subsets of data for control and training conditions
wm.c = subset(wm, wm$train == "0")
wm.t = subset(wm, wm$train == "1")

wm.c.out = describe(wm.c)
wm.c.out

wm.t.out = describe(wm.t)
wm.t.out
```

Dependent t-tests

```
# Dependent t-tests
t.test(wm.c$pre, wm.c$post, paired = T)
t.test(wm.t$pre, wm.t$post, paired = T)

# Cohen's d for dependent t-test
d.c = (wm.c.out[4,3])/(wm.c.out[4,4])
d.c
d.t = (wm.t.out[4,3])/(wm.t.out[4,4])
d.t
```

Dependent t-tests

```
> # Dependent t-tests
> t.test(wm.c$pre, wm.c$post, paired = T)

	Paired t-test

data:  wm.c$pre and wm.c$post
t = -9.0089, df = 39, p-value = 4.511e-11
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.41843 -1.53157
sample estimates:
mean of the differences
                 -1.975
```

Dependent t-tests

```
> t.test(wm.t$pre, wm.t$post, paired = T)

    Paired t-test

data:  wm.t$pre and wm.t$post
t = -14.4924, df = 79, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -3.966489 -3.008511
sample estimates:
mean of the differences
              -3.4875
```

Dependent t-tests

```
>
> # Cohen's d for dependent t-test
> d.c = (wm.c.out[4,3])/(wm.c.out[4,4])
> d.c
[1] 1.42443
> d.t = (wm.t.out[4,3])/(wm.t.out[4,4])
> d.t
[1] 1.620297
>
>
```

Independent t-tests

```
# Independent t-tests
t.test(wm$gain ~ wm$train, var.equal = T)

# Cohen's d for independent t-tests
pooled.sd = (79/118 * wm.t.out[4,4]) + (39/118 * wm.c.out[4,4])
d.ct = (wm.t.out[4,3] - wm.c.out[4,3]) / pooled.sd
d.ct
```

Independent t-tests

```
    Two Sample t-test

data:  wm$gain by wm$train
t = -4.0404, df = 118, p-value = 9.539e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.2538109 -0.7711891
sample estimates:
mean in group 0 mean in group 1
        1.9750          3.4875


>
> # Cohen's d for independent t-tests
> pooled.sd = (79/118 * wm.t.out[4,4]) + (39/118 * wm.c.out[4,4])
> d.ct = (wm.t.out[4,3] - wm.c.out[4,3]) / pooled.sd
> d.ct
[1] 0.7963634
```

Jaeggi et al. (2008)