Paired Samples and Block

Chapter 21

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Pairing

Family Treatment Weight Change for Young Anorexia Patients: Contains pre and post treatment weights for young female anorexia patients.

- The data are paired rather than independent.

- Blocking involves pairing arising from an experiment.

- Matching involves pairing arising from an observational study.

- With pairing, we look at the differences.

```
Prewt  Postwt
 83.8    95.2
 83.3    94.3
 86.0    91.5
 82.5    91.9
 86.7   100.3
 79.6    76.7
 76.9    76.8
 94.2   101.6
 73.4    94.9
 80.5    75.2
 81.6    77.8
 82.1    95.5
 77.6    90.7
 83.5    92.5
 89.9    93.8
 86.0    91.7
 87.3    98.0
```
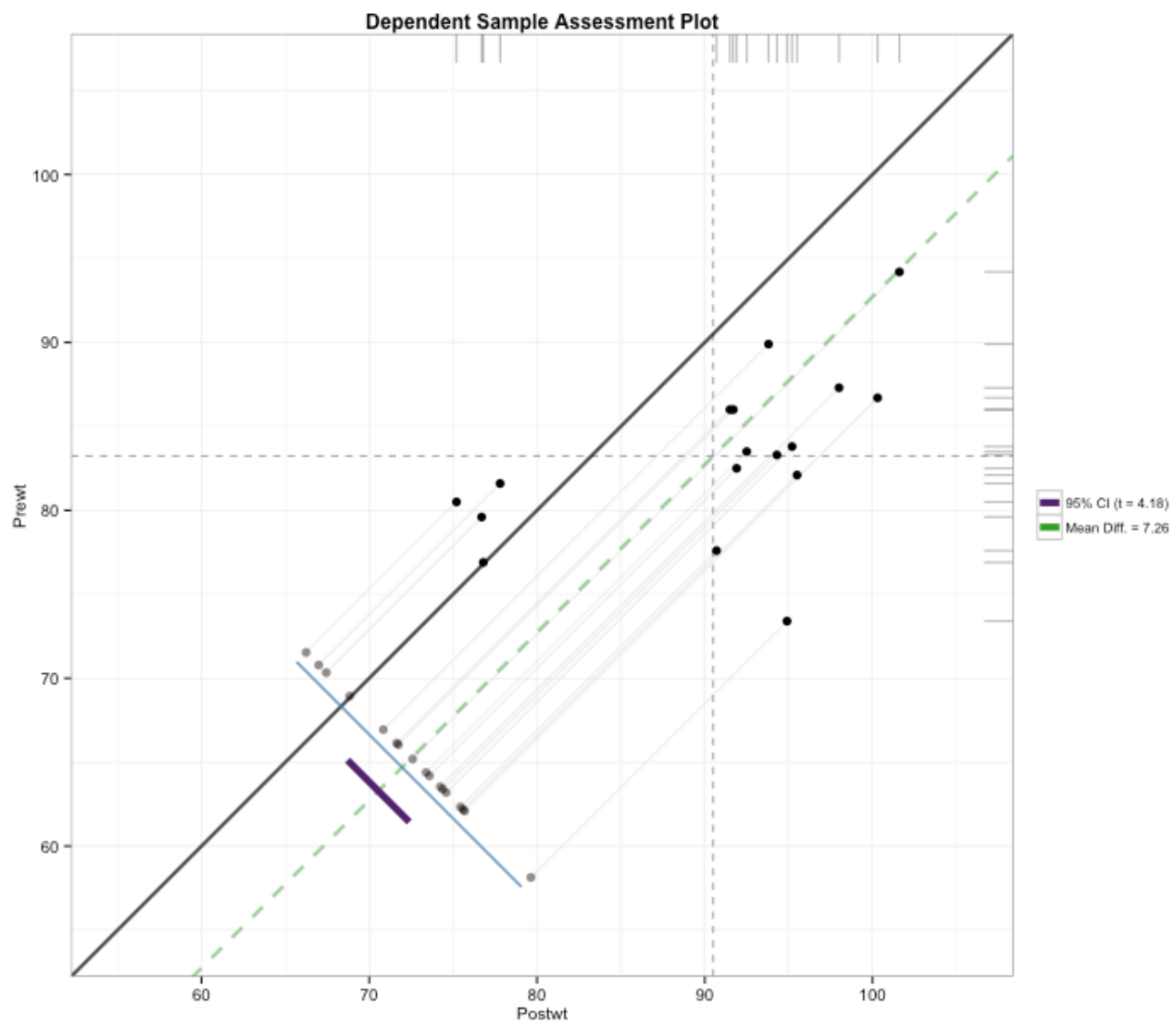
Differences

- For paired data, create a new data set of the differences.

- We can now look only at the differences.

- Ignoring the originaldata, we now have a single data set.

- Proceed with a one-sample t-test. This process is called a paired t-test.

```
Prewt Postwt Diff
 83.8    95.2 11.4
 83.3    94.3 11.0
 86.0    91.5  5.5
 82.5    91.9  9.4
 86.7   100.3 13.6
 79.6    76.7 -2.9
 76.9    76.8 -0.1
 94.2   101.6  7.4
 73.4    94.9 21.5
 80.5    75.2 -5.3
 81.6    77.8 -3.8
 82.1    95.5 13.4
 77.6    90.7 13.1
 83.5    92.5  9.0
 89.9    93.8  3.9
 86.0    91.7  5.7
 87.3    98.0 10.7
```

Dependent Sample t-test

```
granovagg.ds(anorexia.sub[,1:2], revc=TRUE)
```

```
                            Summary Statistics
n                                        17.000
Postwt mean                              90.494
Prewt mean                               83.229
mean(D = Postwt - Prewt)                  7.265
SD(D)                                     7.157
Effect Size                               1.015
r(Postwt, Prewt)                          0.538
r(Postwt + Prewt, D)                      0.546
Lower 95% Confidence Interval             3.585
Upper 95% Confidence Interval            10.945
t (D-bar)                                 4.185
df.t                                     16.000
p-value (t-statistic)                     0.001
```

Dependent Sample Assessment Plot

Prewt

Postwt

95% CI (t = 4.18)
Mean Diff. = 7.26

Assumptions and Conditions

Paired Data Condition

- The data must be paired.

- Only use pairing if there is a natural matching.

- The two-sample t-test and the paired t-test are not interchangeable.

Independence Assumption

- For paired data, the groups are never independent.

- Need differences independent, not individuals

- Randomization ensures independence.

Normal Population Assumption

- Need to assume the differences follow a Normal model.

- Nearly Normal Condition:

  - Sketch a histogram and normal probability plot of the differences.

  - Normality less important for larger sample sizes.

  - Even if the individual measurements are skewed, bimodal or have outliers, the differences may still be Normal.