# 1 Group Analysis

1.1 Introduction
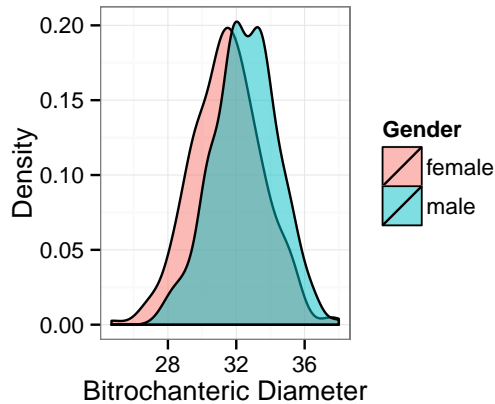
1.2 Summary of the Dataset

Weight

Weight was measured for 507 physically active individuals - 247 men and 260 women. The distribution ranged from 42 kilograms to 116.4 kilograms. The mean weight and quartiles was signifigantly higher for men than women. We observe several outliers in the upper end of the range for both men and women. This may be due to the fact that the population sampled included a number of highly physicaly fit individuals with higher than average muscle mass.
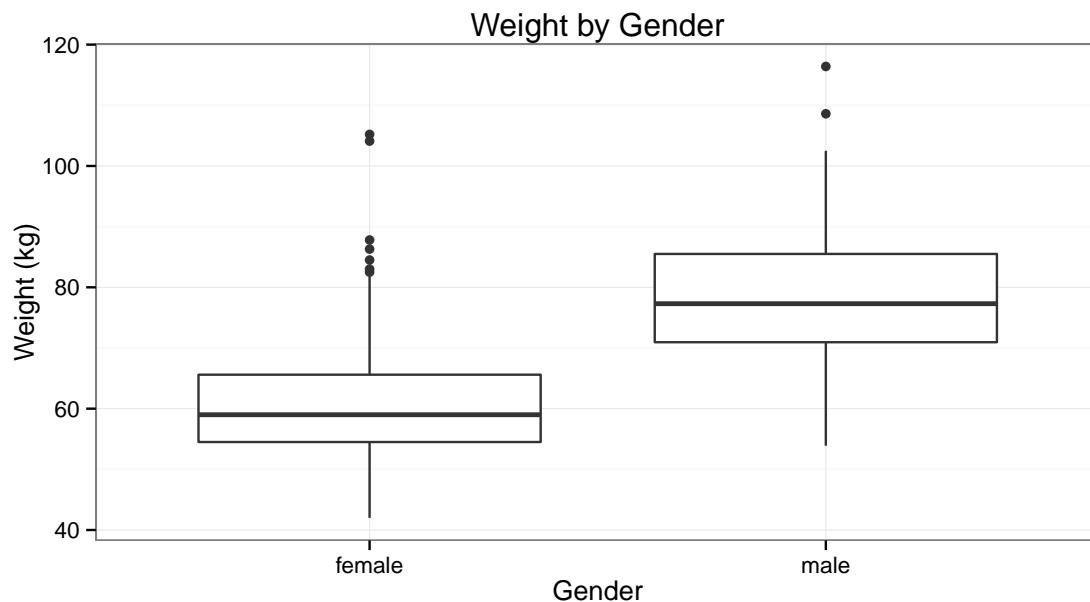

Bitrochanteric Diameter and Hip Girth

Bitrochanteric diameter is the distance between the outer points of the hips and hip girth is the circumference of the hip area measured at the level of the bitrochanteric diameter. The density distributions for both measures are normally distributed (though hip girth is skewed slightly right) and very similar in distribution for both men and women. A scatter plot of hip girth vs. weight suggests that weight increases linerally with increase in hip girth.
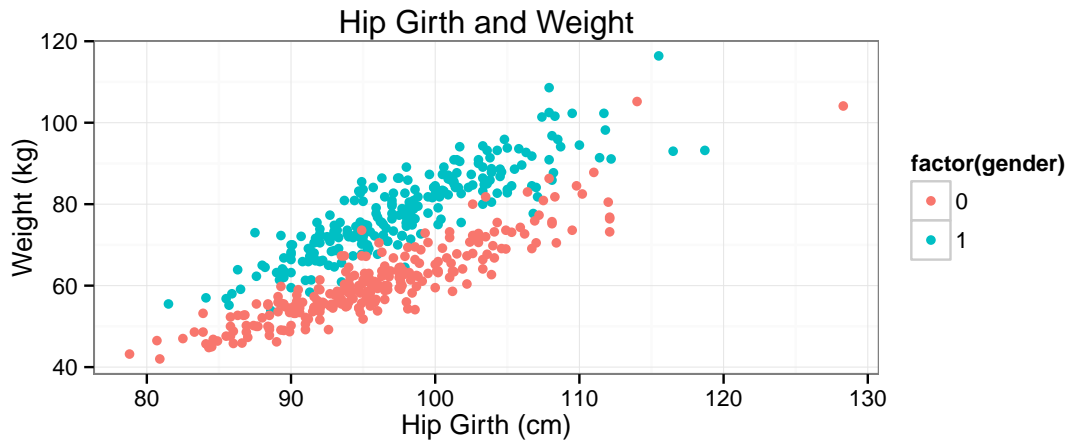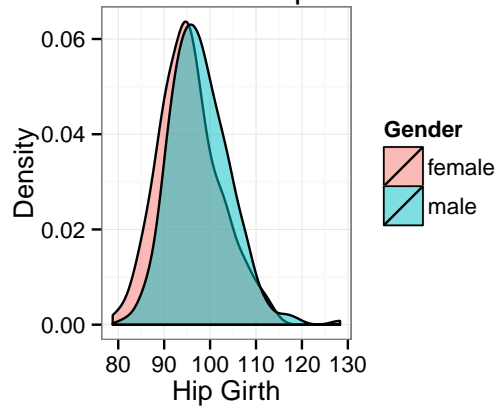
Chest and Shoulder

Chest girth was measured at the nipple line in males and just above breast tissue in females at mid-expiration and shoulder girth was measured over deltoid muscles in both males and females. The density distributions for the two variables are quite similar. Women have narrower, though slightly skeewed, distribution with a much lower mean than that of the men. The scatterplots are also similar in that the regression lines for men and women are nearly identical, indicating that weight increases linearly with increase in shoulder girth, independant of gender.

Distribution of Chest Girth

Chest Girth and Weight

Distribution of Shoulder Girth

Shoulder Girth and Weight
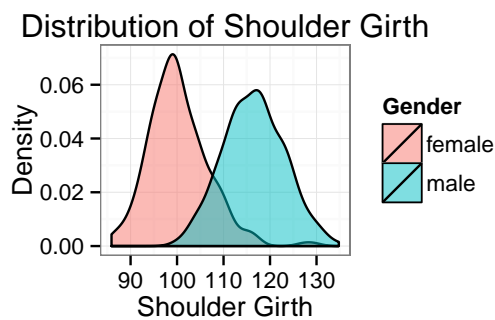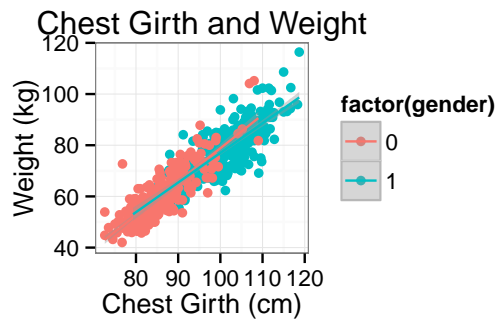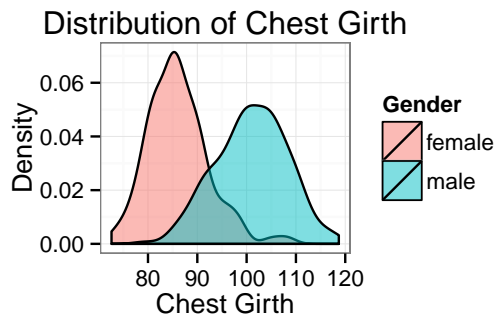
Wrist and Navel

Wrist minimum girth is an average of right and left girths and navel (or abdominal) girth
was measured at umbilicus and the iliac crest, using the iliac crest as a landmark. Wrist
girth is bimodally distributed, but when divided into male and female, the distributions
are normal with some outliers at the high end of the range for females. The distributions
for navel girth is normal and remarkably similar for males and females. The scatterplot of
navel girth against weight shows a linear relationship with weight increasing with increased
naval girth.

Distribution of Min. Wrist Girth

Distribution of Navel Girth
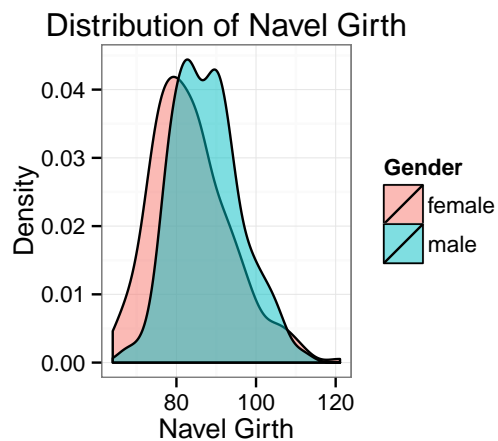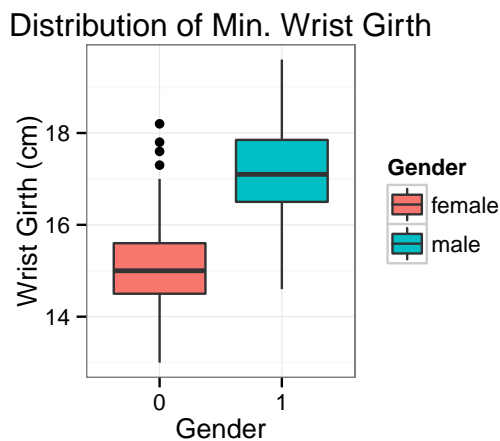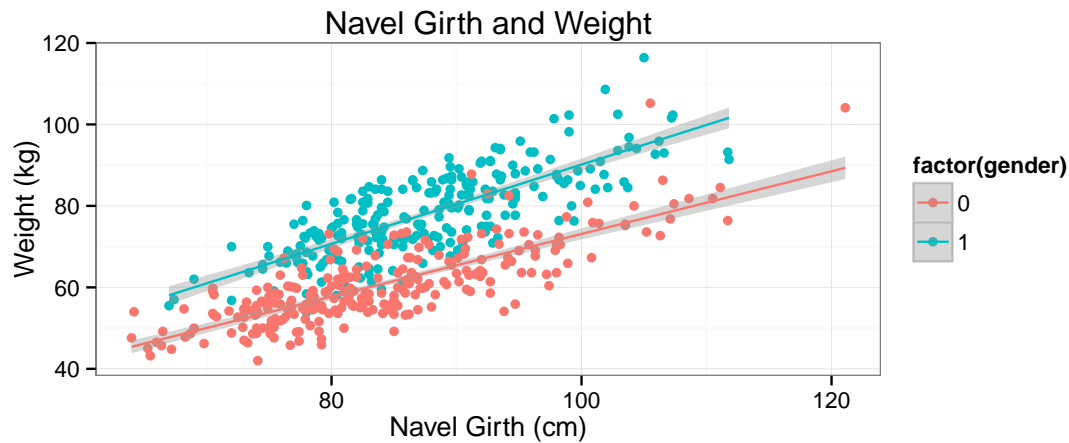
1.3   Initial Multiple Linear Regression Model

The initial model we are interested in fitting is of the form:

$$\text{weight}_i = \beta_0 + \beta_1 \text{ shoulder}_i + \beta_2 \text{ chest}_i + \beta_3 \text{ waist}_i + \beta_4 \text{ navel}_i + \beta_5 \text{ hip}_i + \beta_6 \text{ thigh}_i + \beta_7 \text{ bicep}_i + \beta_8 \text{ forearm}_i + \beta_9 \text{ knee}_i + \beta_{10} \text{ calf}_i + \beta_{11} \text{ ankle.min}_i + \beta_{12} \text{ wrist.min}_i + \beta_{13} \text{ height}_i$$

Text describing why this model, Where we got the model

```
mlr1 <- lm(weight ~ shoulder + chest + waist + navel + hip + thigh + bicep +
    forearm + knee + calf + ankle.min + wrist.min + height, data = body)
mlr1

##
## Call:
## lm(formula = weight ~ shoulder + chest + waist + navel + hip +
##      thigh + bicep + forearm + knee + calf + ankle.min + wrist.min +
##      height, data = body)
##
## Coefficients:
## (Intercept)     shoulder         chest         waist         navel
##   -1.20e+02     7.81e-02      1.98e-01      3.40e-01      1.17e-03
##          hip        thigh         bicep       forearm          knee
##     2.40e-01     3.14e-01      5.47e-02      5.32e-01      3.01e-01
##         calf    ankle.min     wrist.min        height
##     4.04e-01    -9.63e-03     -1.18e-01      3.28e-01
```

Interpret the model

Discuss potential uses for models of this data (finding ideal weight based on skeletal measurements?) and potential problems for applying to whole population (all participants were physically fit)

2 Individual Analysis

2.1 Regression Trees

2.2 Resampling Inference or something

2.3 Not sure what Yiding decided on

2.4 Model Selection