

R Handout

Linear Model Foundations

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Initialization

```
> options(show.signif.stars=FALSE)
> library(NCStats)
```

Background

Sholl *et al.* (2000) examined the relative sense of direction for female and male subjects. Specifically, 30 male and 30 female subjects were taken to an unfamiliar wooded park and given spatial orientation tests, including being asked to point to the south. The absolute pointing error (in degrees away from due south) was recorded. The results are in `SexDirection.csv`. Use these results to test, at the 5% level, if males have a better sense of direction than females?

```
> setwd("C:/aaaWork/Web/GitHub/NCMTH207/modules/LMFoundations")
> sdir <- read.csv("SexDirection.csv")
> str(sdir)
```

```
'data.frame': 60 obs. of 2 variables:
 $ abserr: int 13 13 38 59 58 8 130 68 23 5 ...
 $ sex : Factor w/ 2 levels "female","male": 2 2 2 2 2 2 2 2 2 2 ...
```

```
> sdir$sexmf <- factor(sdir$sex,levels=c("male","female"))
> levels(sdir$sexmf)
```

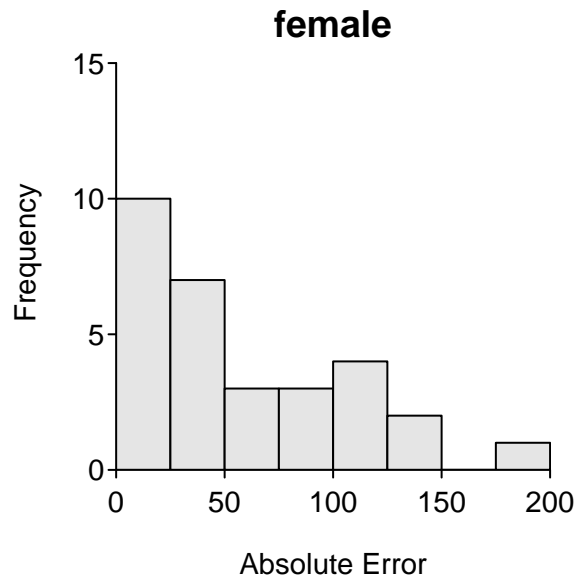
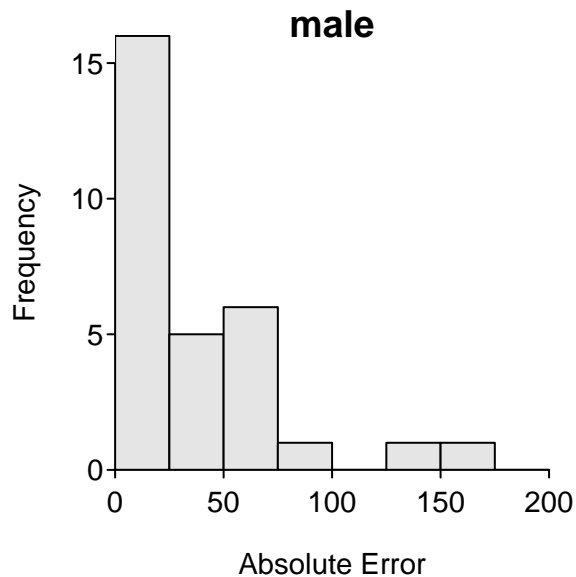
```
[1] "male" "female"
```

```
> levels(sdir$sex)
```

```
[1] "female" "male"
```

Two-Sample t-Test (Traditional Method)

```
> hist(abserr~sexmf,data=sdir,xlab="Absolute Error",w=25)
```



```
> Summarize(abserr~sexmf,data=sdir,digits=2)
```

```
sexmf n mean sd min Q1 median Q3 max
1 male 30 37.6 38.49 3 11.50 22.5 58.75 167
2 female 30 55.8 48.26 3 15.75 35.0 88.25 176
```

```
> levenesTest(abserr~sexmf,data=sdir)
```

```
Df F value Pr(>F)
group 1 2.1692 0.1462
58
```

```
> t.test(abserr~sexmf,data=sdir,var.equal=TRUE)
```

```
t = -1.6149, df = 58, p-value = 0.1118
95 percent confidence interval:
-40.758823 4.358823
sample estimates:
mean in group male mean in group female
37.6 55.8
```

```
> t.test(abserr~sex,data=sdir,var.equal=TRUE)
```

```
t = 1.6149, df = 58, p-value = 0.1118
95 percent confidence interval:
-4.358823 40.758823
sample estimates:
mean in group female mean in group male
55.8 37.6
```

Two-Sample t-Test (As a Linear Model)

```
> lm1 <- lm(abserr~sexmf,data=sdire)
> summary(lm1)
```

Coefficients:

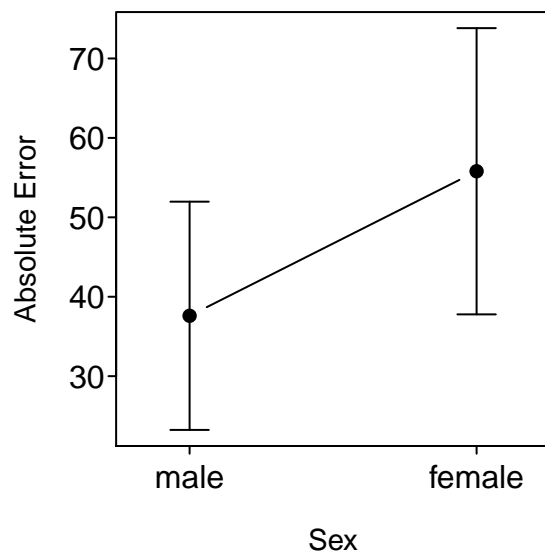
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	37.600	7.969	4.718	1.54e-05
sexmffemale	18.200	11.270	1.615	0.112

Residual standard error: 43.65 on 58 degrees of freedom
Multiple R-squared: 0.04303, Adjusted R-squared: 0.02653
F-statistic: 2.608 on 1 and 58 DF, p-value: 0.1118

```
> cbind(Ests=coef(lm1),confint(lm1))
```

	Ests	2.5 %	97.5 %
(Intercept)	37.6	21.648503	53.55150
sexmffemale	18.2	-4.358823	40.75882

```
> fitPlot(lm1,xlab="Sex",ylab="Absolute Error")
```



```
> anova(lm1)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
sexmf	1	4969	4968.6	2.608	0.1118
Residuals	58	110496	1905.1		