Date	position	legs	abs	visits	clegs	cabs
6/13/12	3	3	5	37	0	2
6/13/12	5	3	5	4	0	2
6/14/12	1	1	3	0	-2	0
6/14/12	2	3	1	0	0	-2
6/14/12	4	3	1	0	0	-2
6/14/12	3	3	5	51	0	2
6/14/12	5	3	5	12	0	2
6/15/12	5	1	3	9	-2	0
6/15/12	1	2	2	11	-1	-1
6/15/12	4	3	5	35	0	2
6/15/12	2	4	4	60	1	1
6/15/12	3	5	1	23	2	-2
6/16/12	1	1	3	25	-2	0
6/16/12	3	2	3	68	-1	0
6/16/12	5	3	3	44	0	0
6/16/12	2	4	3	73	1	0
6/16/12	4	5	3	96	2	0
6/17/12	2	3	1	17	0	-2
6/17/12	4	3	2	39	0	-1
6/17/12	1	3	3	0	0	0
6/17/12	3	3	4	24	0	1
6/17/12	5	3	5	38	0	2
6/18/12	4	1	5	73	-2	2
6/18/12	2	2	5	63	-1	2
6/18/12	1	3	5	23	0	2
6/18/12	5	4	5	42	1	2
6/18/12	3	5	5	100	2	2
6/19/12	1	1	1	1	-2	-2
6/19/12	3	2	1	41	-1	-2
6/19/12	2	3	1	27	0	-2
6/19/12	4	4	1	60	1	-2
6/19/12	5	5	1	56	2	-2
6/20/12	4	1	2	33	-2	-1
6/20/12	1	2	2	11	-1	-1
6/20/12	2	3	2	78	0	-1
6/20/12	3	4	2	91	1	-1
6/20/12	5	5	2	18	2	-1
6/21/12	5	1	2	4	-2	-1
6/21/12	3	2	4	24	-1	1
6/21/12	1	3	3	3	0	0
6/21/12	2	4	5	21	1	2
6/21/12	4	5	1	13	2	-2

6/22/12	4	1	4	1	-2	1
6/22/12	5	2	4	0	-1	1
6/22/12	1	3	4	9	0	1
6/22/12	2	4	4	16	1	1
6/22/12	3	5	4	5	2	1

dfc	vlegs	scalelength	SDscale	mm2abs	mmabs	mm2LL
0	0.87	0.4	0	16.265	4.03298897	5.949
2	0.87	0.4	0	16.265	4.03298897	5.949
2	0.29	0	-10.8	10.289	3.20764711	2.831
1	0.87	0.4	0	5.679	2.38306525	5.949
1	0.87	0.4	0	5.679	2.38306525	5.949
0	0.87	0.4	0	16.265	4.03298897	5.949
2	0.87	0.4	0	16.265	4.03298897	5.949
2	0.29	0	-10.8	10.289	3.20764711	2.831
2	0.58	0.2	-5.4	7.816	2.795711	4.788
1	0.87	0.4	0	16.265	4.03298897	5.949
1	1.305	0.6	5.4	13.103	3.61980663	6.804
0	1.74	0.8	10.8	5.679	2.38306525	7.394
2	0.29	0	-10.8	10.289	3.20764711	2.831
0	0.58	0.2	-5.4	10.289	3.20764711	4.788
2	0.87	0.4	0	10.289	3.20764711	5.949
1	1.305	0.6	5.4	10.289	3.20764711	6.804
1	1.74	0.8	10.8	10.289	3.20764711	7.394
1	0.87	0.4	0	5.679	2.38306525	5.949
1	0.87	0.4	0	7.816	2.795711	5.949
2	0.87	0.4	0	10.289	3.20764711	5.949
0	0.87	0.4	0	13.103	3.61980663	5.949
2	0.87	0.4	0	16.265	4.03298897	5.949
1	0.29	0	-10.8	16.265	4.03298897	2.831
1	0.58	0.2	-5.4	16.265	4.03298897	4.788
2	0.87	0.4	0	16.265	4.03298897	5.949
2	1.305	0.6	5.4	16.265	4.03298897	6.804
0	1.74	0.8	10.8	16.265	4.03298897	7.394
2	0.29	0	-10.8	5.679	2.38306525	2.831
0	0.58	0.2	-5.4	5.679	2.38306525	4.788
1	0.87	0.4	0	5.679	2.38306525	5.949
1	1.305	0.6	5.4	5.679	2.38306525	6.804
2	1.74	0.8	10.8	5.679	2.38306525	7.394
1	0.29	0	-10.8	7.816	2.795711	2.831
2	0.58	0.2	-5.4	7.816	2.795711	4.788
1	0.87	0.4	0	7.816	2.795711	5.949
0	1.305	0.6	5.4	7.816	2.795711	6.804
2	1.74	0.8	10.8	7.816	2.795711	7.394
2	0.29	0	-10.8	7.816	2.795711	2.831
0	0.58	0.2	-5.4	13.103	3.61980663	4.788
2	0.87	0.4	0	10.289	3.20764711	5.949
1	1.305	0.6	5.4	16.265	4.03298897	6.804
1	1.74	0.8	10.8	5.679	2.38306525	7.394

1	0.29	0	-10.8	13.103	3.61980663	2.831
2	0.58	0.2	-5.4	13.103	3.61980663	4.788
2	0.87	0.4	0	13.103	3.61980663	5.949
1	1.305	0.6	5.4	13.103	3.61980663	6.804
0	1.74	0.8	10.8	13.103	3.61980663	7.394

mm2RL	mm2legs	mmlegs
5.802	11.751	3.42797316
5.802	11.751	3.42797316
2.868	5.699	2.38725784
5.802	11.751	3.42797316
5.802	11.751	3.42797316
5.802	11.751	3.42797316
5.802	11.751	3.42797316
2.868	5.699	2.38725784
4.785	9.573	3.0940265
5.802	11.751	3.42797316
6.651	13.455	3.66810578
8.059	15.453	3.9310304
2.868	5.699	2.38725784
4.785	9.573	3.0940265
5.802	11.751	3.42797316
6.651	13.455	3.66810578
8.059	15.453	3.9310304
5.802	11.751	3.42797316
5.802	11.751	3.42797316
5.802	11.751	3.42797316
5.802	11.751	3.42797316
5.802	11.751	3.42797316
2.868	5.699	2.38725784
4.785	9.573	3.0940265
5.802	11.751	3.42797316
6.651	13.455	3.66810578
8.059	15.453	3.9310304
2.868	5.699	2.38725784
4.785	9.573	3.0940265
5.802	11.751	3.42797316
6.651	13.455	3.66810578
8.059	15.453	3.9310304
2.868	5.699	2.38725784
4.785	9.573	3.0940265
5.802	11.751	3.42797316
6.651	13.455	3.66810578
8.059	15.453	3.9310304
2.868	5.699	2.38725784
4.785	9.573	3.0940265
5.802	11.751	3.42797316
6.651	13.455	3.66810578
8.059	15.453	3.9310304

2.868	5.699	2.38725784
4.785	9.573	3.0940265
5.802	11.751	3.42797316
6.651	13.455	3.66810578
8.059	15.453	3.9310304

```r
# load data
longmods <- read.csv("malematechoicevalues.csv")
head(longmods)
str(longmods)


# explore data

par(mfrow=c(2,2))
hist(longmods$visits)
hist(sqrt(longmods$visits))
hist(log(longmods$visits))
hist(log10(longmods$visits))
par(mfrow=c(1,1))


# first plots

par(mfrow=c(1,3))
boxplot(longmods$visits~longmods$dfc,varwidth=TRUE)
boxplot(longmods$visits~longmods$mmlegs,varwidth=TRUE)
boxplot(longmods$visits~longmods$mmabs,varwidth=TRUE)
par(mfrow=c(1,1))


testmod.1<-glm(visits~dfc,data=longmods,family="poisson")
library(car)
Anova(testmod.1)
summary(testmod.1)



testmod.2<-glm(visits~mmlegs,data=longmods,family="poisson")
summary(testmod.2)

boxplot(longmods$visits~longmods$dfc)

# looks like big effect of position, not so much others,
# but then again have complex interrelationships

# no ints model without random
glm.1<-glm(visits~dfc+mmlegs+mmabs, data=longmods,family="poisson")
summary(glm.1)

# intriguing, but massive overdisp

glm.1q<-glm(visits~dfc+mmlegs+mmabs, data=longmods,family="quasipoisson")
summary(glm.1q)
```

```
# try with random effects
library(lme4)
glmer.1<-glmer(visits~dfc+mmlegs+mmabs+(1|Date),
 data=longmods,family="poisson")
summary(glmer.1)


# try nonlinear mod

glmer.nl1<-
 glmer(visits~dfc+mmlegs+mmabs+I((dfc)^2)+I((mmlegs)^2)+I((mmabs)^2)
                  +I(dfc*mmlegs)+I(dfc*mmabs)+I(mmlegs*mmabs)+(1|Date),
                  data=longmods,family="poisson")
summary(glmer.nl1)

# different syntax
glmer.nl1alt<-
 glmer(visits~(dfc+clegs+cabs)^2+I((dfc)^2)+I((clegs)^2)+I((cabs)^2)
                    +(1|Date),
                    data=longmods,family="poisson")
summary(glmer.nl1alt)

# see if params sensitive to random effects structure
glm.nl1alt<-
 glm(visits~(dfc+clegs+cabs)^2+I((dfc)^2)+I((clegs)^2)+I((cabs)^2),
                 data=longmods,family="poisson")
summary(glm.nl1alt)

#yes. we see changes to the signs of the estimates for the linear
 parameters

# try with poly() function
glmer.nlp<-glmer(visits~poly(dfc,2)+poly(mmlegs,2)+poly(mmabs,2)
                  +dfc:mmlegs+dfc:mmabs+mmlegs:mmabs+(1|Date),
                  data=longmods,family="poisson")
summary(glmer.nlp)

#look at relative visitation rate
relv<-longmods$visits/mean(longmods$visits)
relv


lm.nlp<-lmer(relv~poly(dfc,2)+poly(clegs,2)+poly(cabs,2)
              +dfc:clegs+dfc:cabs+clegs:cabs+(1|Date),
              data=longmods)
summary(lm.nlp)
```

```
# visualize with tps

# first get resids from model of position effect

mod4res<-glm(visits~dfc+I((dfc)^2),data=longmods,family="poisson")
summary(mod4res)

library(fields)
Y<-mod4res$residuals
x<-data.frame(longmods$clegs,longmods$cabs)
X<-data.matrix(x)
fit<-Tps(X,Y,lambda=-111)
?Tps
summary(fit)
tps.out<-predict.surface(fit)
image(tps.out)


# nope, prob need to plot by quantile




head(longmods)

summary(longmods)

library(languageR)

?plotLMER.fnc
clegsqs<-list("-2","-1","0","1","2")
?par
par(mfrow=c(1,2),oma=c(4.5,4.5,1.5,1.5),mar=c(0,0,0,0))
plotLMER.fnc(glmer.nl1alt,pred="cabs",fun=exp,ylim=c(0,100),xlim=c(-2.5,2
 .5),ann=F,axes=F,lwd=3)
points(longmods$visits~jitter(longmods$cabs))
axis(side=1,cex.axis=2,lwd=2)
mtext(outer=FALSE, side=1, line=3, text="Standardized abdomen
 width",cex=1.25)
axis(side=2,cex.axis=2,lwd=2)
mtext(outer=FALSE, side=2, line=3, text="Male approaches",cex=1.25)

plotLMER.fnc(glmer.nl1alt,pred="clegs",
             xlabel="Standardized leg size",
             ylabel="Male
 approaches",fun=exp,ylim=c(0,100),xlim=c(-2.5,2.5),ann=F,axes=F,lwd=3)
```

```
points(longmods$visits~jitter(longmods$clegs))
axis(side=1,cex.axis=0.9,lwd=2,labels=c("Mn Male","0.5 X Mn Fem","Mn
 Fem","1.5 X Mn Fem","2 X Mn Fem"),at=c(-2,-1,0,1,2))
mtext(outer=FALSE, side=1, line=3, text="Leg scale length",cex=1.25)


par(mfrow=c(1,1))
plotLMER.fnc(glmer.nl1alt,pred="I((dfc)^2)",ylabel="Male approaches",
 fun=exp,ylim=c(0,100),xlim=c(-0.5,2.5),ann=F,axes=F)
points(longmods$visits~jitter(longmods$dfc))
axis(side=1,cex.axis=2)
mtext(outer=FALSE, side=1, line=3, text="Distance from centre",cex=1.25)



# setup expression for equation
?function
nlselclegs<-function(x,dfc=0,cabs=0) {

 3.508+0.099*dfc+0.156*x+0.366*cabs-0.311*(dfc*dfc)-0.024*(x*x)-0.006*(ca
 bs*cabs)
  +0.042*(dfc*x)-0.020*(dfc*cabs)-0.073*(x*cabs)
}


plot(longmods$visits~jitter(longmods$clegs))
curvedat<-curve(nlselpexp(x,dfc=1,cabs=1),from=-2,to=2,lty=1)
str(curvedat)
lines(curvedat$x,exp(curvedat$y))

# not working




# alt, split data by leg quantiles and plot effect of abd for each, vice
 versa
head(longmods)
smlegs<-longmods[longmods$clegs<0,]
str(smlegs)
legsmed<-longmods[longmods$clegs==0,]
str(legsmed)
lglegs<-longmods[longmods$clegs>0,]
str(lglegs)


# plot effect of cabs for each subset
plot(smlegs$visits~smlegs$cabs)
```

```
plotmod.1<-glm(visits~poly(cabs,2),data=smlegs,family=poisson)
summary(plotmod.1)
newcabs=seq(-2,2,0.05)
length(newcabs)


yvsml<-predict(plotmod.1,list(cabs=newcabs),type="response",se.fit=TRUE)
par(mfrow=c(1,3))
plot(smlegs$visits~jitter(smlegs$cabs),ylim=c(0,100))
lines(yvsml$fit~newcabs)
lines((yvsml$fit+yvsml$se.fit)~newcabs,lty=c(2),col="black")
lines((yvsml$fit-yvsml$se.fit)~newcabs,lty=c(2),col="black")



plotmod.2<-glm(visits~poly(cabs,2),data=legsmed,family=poisson)
yvmdl<-predict(plotmod.2,list(cabs=newcabs),type="response",se.fit=TRUE)

plot(legsmed$visits~jitter(legsmed$cabs),tick=FALSE,labels=FALSE,ylim=c(0
 ,100))

lines(yvmdl$fit~newcabs)
lines((yvmdl$fit+yvmdl$se.fit)~newcabs,lty=c(2),col="black")
lines((yvmdl$fit-yvmdl$se.fit)~newcabs,lty=c(2),col="black")

plotmod.3<-glm(visits~poly(cabs,2),data=lglegs,family=poisson)
yvlgl<-predict(plotmod.3,list(cabs=newcabs),type="response",se.fit=TRUE)

plot(lglegs$visits~jitter(lglegs$cabs),tick=FALSE,labels=FALSE,ylim=c(0,1
 00))

lines(yvlgl$fit~newcabs)
lines((yvlgl$fit+yvlgl$se.fit)~newcabs,lty=c(2),col="black")
lines((yvlgl$fit-yvlgl$se.fit)~newcabs,lty=c(2),col="black")
par(mfrow=c(1,1))



# split data by abs quantiles and plot effect of legs for each
head(longmods)
smcabs<-longmods[longmods$cabs<0,]
str(smcabs)
medcabs<-longmods[longmods$cabs==0,]
str(medcabs)
lgcabs<-longmods[longmods$cabs>0,]
str(lgcabs)

# plot effect of cabs for each subset
```

```
plot(smcabs$visits~smcabs$clegs)
plotmod.4<-glm(visits~poly(clegs,2),data=smcabs,family=poisson)
summary(plotmod.4)
newclegs=seq(-2,2,0.05)



yvsmc<-predict(plotmod.
 4,list(clegs=newclegs),type="response",se.fit=TRUE)
par(mfrow=c(1,3))
plot(smcabs$visits~jitter(smcabs$clegs),ylim=c(0,100))
lines(yvsmc$fit~newclegs)
lines((yvsmc$fit+yvsmc$se.fit)~newclegs,lty=c(2),col="black")
lines((yvsmc$fit-yvsmc$se.fit)~newclegs,lty=c(2),col="black")



plotmod.5<-glm(visits~poly(clegs,2),data=medcabs,family=poisson)
yvmdc<-predict(plotmod.
 5,list(clegs=newclegs),type="response",se.fit=TRUE)

plot(medcabs$visits~jitter(medcabs$clegs),tick=FALSE,labels=FALSE,ylim=c(
 0,100))

lines(yvmdc$fit~newclegs)
lines((yvmdc$fit+yvmdc$se.fit)~newclegs,lty=c(2),col="black")
lines((yvmdc$fit-yvmdc$se.fit)~newclegs,lty=c(2),col="black")

plotmod.6<-glm(visits~poly(clegs,2),data=lgcabs,family=poisson)
yvlgc<-predict(plotmod.
 6,list(clegs=newclegs),type="response",se.fit=TRUE)

plot(lgcabs$visits~jitter(lgcabs$clegs),tick=FALSE,labels=FALSE,ylim=c(0,
 100))

lines(yvlgc$fit~newclegs)
lines((yvlgc$fit+yvlgc$se.fit)~newclegs,lty=c(2),col="black")
lines((yvlgc$fit-yvlgc$se.fit)~newclegs,lty=c(2),col="black")
par(mfrow=c(1,1))


glmer.2<-update(glmer.nl1alt,~. - dfc:cabs)
glmer.nl1ML<-update(glmer.nl1,REML=FALSE)
glmer.2ML<-update(glmer.2,REML=FALSE)
anova(glmer.nl1ML,glmer.2ML)
summary(glmer.2)

glmer.3<-update(glmer.2,~. - dfc:clegs)
```

```
glmer.3ML<-update(glmer.3,REML=FALSE)
anova(glmer.3ML,glmer.2ML)
summary(glmer.3)


summary(longmods)
head(longmods)

newcabs<-seq(-3,3,0.01)
length(newcabs)

predcabsf<-function(x) 3.508+0.366*(x)-0.0062(x^2)

predcabsf(newcabs)



citation()
```