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## Relationships between waiter actions and customer tipping.

Statistics 480  
Homework 10

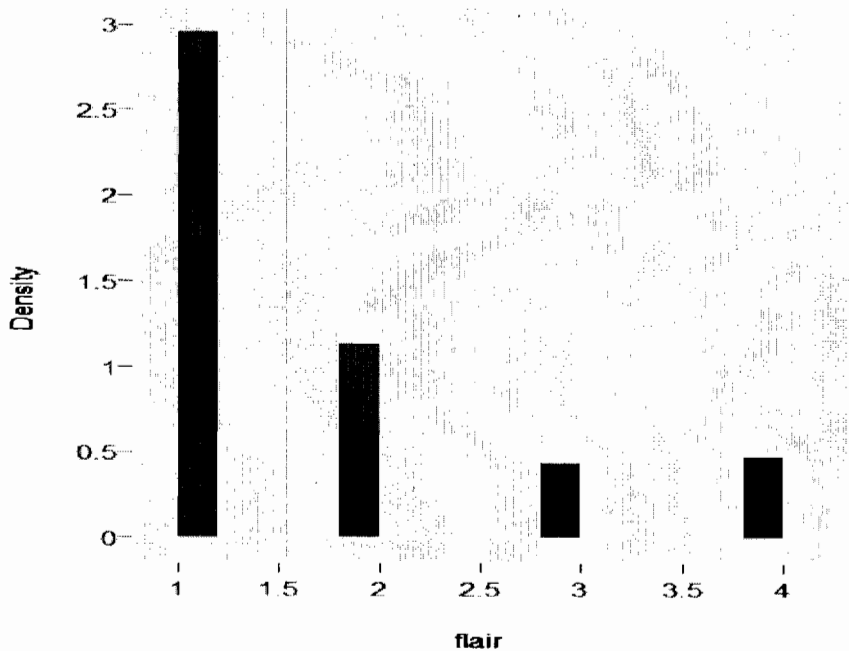
### Attributes of a Good Server

Two attributes of a waiter that are of particular interest to me are the act of the waiters wearing pieces of flair and waiters physically touching their customers. These actions could be related to either the waiters' personality or a particular restaurant's operating policy. Regardless, if the customer feels an increase level of happiness due to the waiter's flair or feels a personal connection with the waiter during physical contact situations, a waiter's tip percentage could increase. I will initially attempt to evaluate these two actions of a waiter to hopefully discover the relationships between flair and touching with large tipping frequencies.

*Good intro*

### Flairing

Figure 1. Histogram of flair.



*Great use of variety of tools & interesting findings.*

```

ss<-read.csv(file.choose())
head(ss)
library(ggplot)
ss$id<-1:nrow(ss)
ssmelt<-melt(ss,
id=c("id","flair","touch","squatt","comparat
ive_tips"), measure=c("pcttip","big_tips"),
preserve=FALSE)
head(ssmelt)ss$flair<-factor(ss$flair,
level=c(0,1,2,3,4))

```

```

> cast(ssmelt, flair~variable,
c(length,mean))
  flair pcttip_length pcttip_mean
big_tips_length big_tips_mean
1 1 1367 16.63569 1351
34.59437
2 2 523 15.83992 515
32.76699
3 3 199 15.65578 197
32.27411
4 4 223 16.54260 219
37.84932

```

```

anova(model)
Analysis of Variance Table

```

```

Response: pcttip
      Df Sum Sq Mean Sq F value Pr(>F)
flair  3  367   122.79583 2.806e-05
***
Residuals 2324 35699    15
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05
'.' 0.1 ' ' 1

```

```
> summary(model)
```

```

Call:
lm(formula = pcttip ~ flair, data = ss)

```

```

Residuals:
    Min     1Q   Median     3Q    Max
-11.635 -1.635  1.179  2.365 14.179

```

```

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 16.63517  0.10566 157.443 <
2e-16 ***
flair2   -0.81456  0.20064  -4.060 5.07e-
05 ***
flair3   -0.98591  0.29595  -3.331
0.000878 ***
flair4   -0.09257  0.28293  -0.327
0.743566
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05
'.' 0.1 ' ' 1


```

```

Residual standard error: 3.919 on 2324
degrees of freedom
(7 observations deleted due to
missingness)
Multiple R-Squared: 0.01017, Adjusted R-
squared: 0.008891
F-statistic: 7.958 on 3 and 2324 DF, p-value:
2.806e-05

```

From the Anova, a significant difference was observed between levels of flair. This variable seems to have a hyperbola shape in regards to the mean values.

(?) looks like  to me  
oh, wait, that is a hyperbola.

## Touching

```
> cast(ssmelt, touch~variable, c(length,mean))
touch pcttip_length pcttip_mean big_tips_length big_tips_mean
1 1 1212 16.03446 1193 32.43671
2 2 826 16.69855 816 36.02083
3 3 194 16.68557 193 36.53368
4 4 80 17.07500 80 38.97500
```

*too many decimal places  
use option (digits=2)*

Figure 2. Percentage of meal tipped determined by waiter touching.

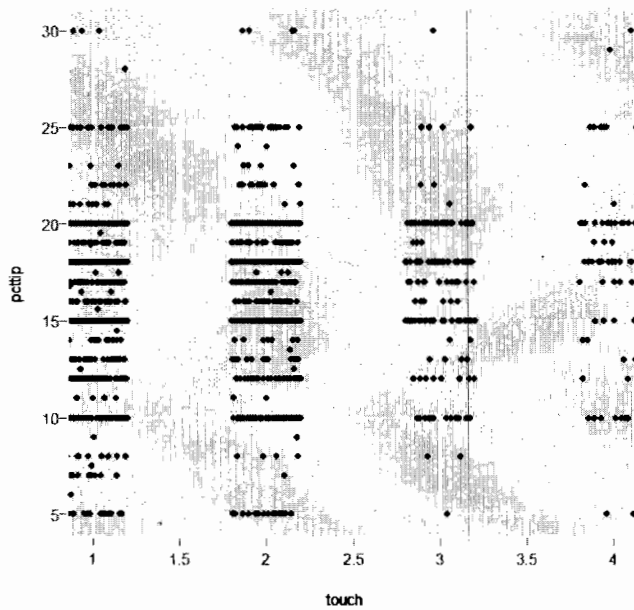
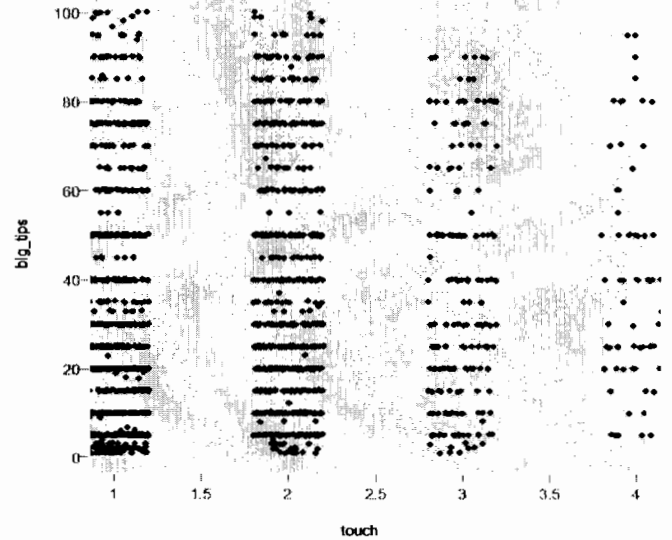


Figure 3. Largest percentage of meal tipped determined by waiter touching.



```
> qplot(touch, pcttip, data=ss, type="jitter")
> qplot(touch, big_tips, data=ss, type="jitter")
```

Figures 2 and 3 illustrate the percentage of each meal tipped and the largest percentage of each meal tipped when waiters touch their customers. Larger tips decrease in frequency as waiters increase the frequency of touching their customers. This could be applicable in fine dining establishments where patrons are concerned with exceptional service but with little exposure to the wait staff.

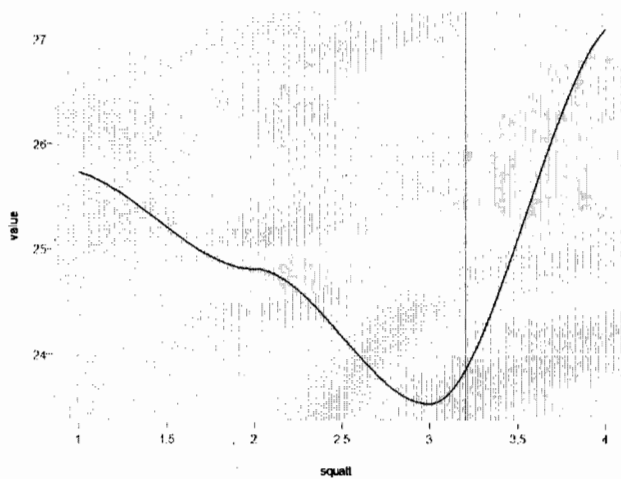
*Interesting! would be good to  
add smoots or boxplots  
to help judge the differences*

## Squatting

The act of a waiter squatting or sitting at a customers' table can influence amount of tips received from their customers. From figure 4, on average, waiters who either always squat or always do not squat at a customers' table received higher tip percentages. This could be due to not the act of squatting, but to the composure or the consistency of the waiters. Typically, waiters that are consistent are more calm and provide better service compared to waiters that occasionally squat at tables due to fatigue or other physical stresses. — *Good hypothesis*

```
> cast(ssmelt, squatt~variable, c(length,mean))
  squatt pcttip_length pcttip_mean big_tips_length big_tips_mean
1     1     1097  16.48732     1080   35.11019
2     2     662  16.16375     653   33.56815
3     3     337  15.81092     333   31.33033
4     4     216  17.19676     216   36.97685
```

Figure 4. Mean values of percentage of meal tipped by the frequency of a waiter squatting or sitting at the customers' table.



```
sq<-cast(ssmelt, squatt~., mean)
qplot(squatt, value, data=sq, type="smooth")
```

### Interactions of said variables

The following table of means identifies interactions between the variables of squatt, touch, and flair on mean percentage of meal tipped.

```
> cast(ssmelt, flair+touch+squatt ~., mean, margins=TRUE)
```

flair	touch	squatt	value
1	1	1	25.66836
2	1	1	23.95688
3	1	1	22.62500
4	1	1	23.97826
5	1	2	27.71655
6	1	2	25.15957
7	1	2	23.61905
8	1	2	23.98611
9	1	3	27.22222
10	1	3	29.66071
11	1	3	22.57143
12	1	3	29.08333
13	1	4	28.66667
14	1	4	32.14286
15	1	4	28.08333
16	1	4	26.46000
17	1	NA	25.56217
18	2	1	21.98992
19	2	1	21.98802
20	2	1	22.84812
21	2	1	21.89474
22	2	2	26.35606
23	2	2	24.82721
24	2	2	24.29688
25	2	2	28.96429
26	2	3	27.00000
27	2	3	29.68182
28	2	3	23.61702
29	2	3	32.40909
30	2	4	20.83333
31	2	4	34.22222
32	2	NA	24.23823
33	3	1	19.98529
34	3	1	18.98750
35	3	1	25.84211
36	3	1	25.85714
37	3	2	23.40816
38	3	2	27.76563
39	3	2	21.78571
40	3	2	34.63158
41	3	3	26.50000
42	3	3	22.87500
43	3	3	19.38889
44	3	3	19.77778
45	3	4	38.50000
46	3	4	5.50000
47	3	4	26.50000
48	3	NA	23.92298
49	4	1	26.10256
50	4	1	26.63830
51	4	1	18.93333
52	4	1	27.39286
53	4	2	34.63889
54	4	2	26.05357
55	4	2	23.55102
56	4	2	30.85714
57	4	3	29.16667
58	4	3	39.16667
59	4	3	35.10000
60	4	3	15.10000
61	4	4	28.25000
62	4	4	17.50000
63	4	4	35.00000
64	4	4	26.27273
65	4	NA	27.09955
66	<NA>	1	24.17080
67	<NA>	2	26.30085
68	<NA>	3	26.58398
69	<NA>	4	28.02500

At first observation, the range in mean values of tipping percentage is from approximately 17.5 % to 39%. Both of the values occur when waiters always wear flair.

*How could you summarize this graphically?*

