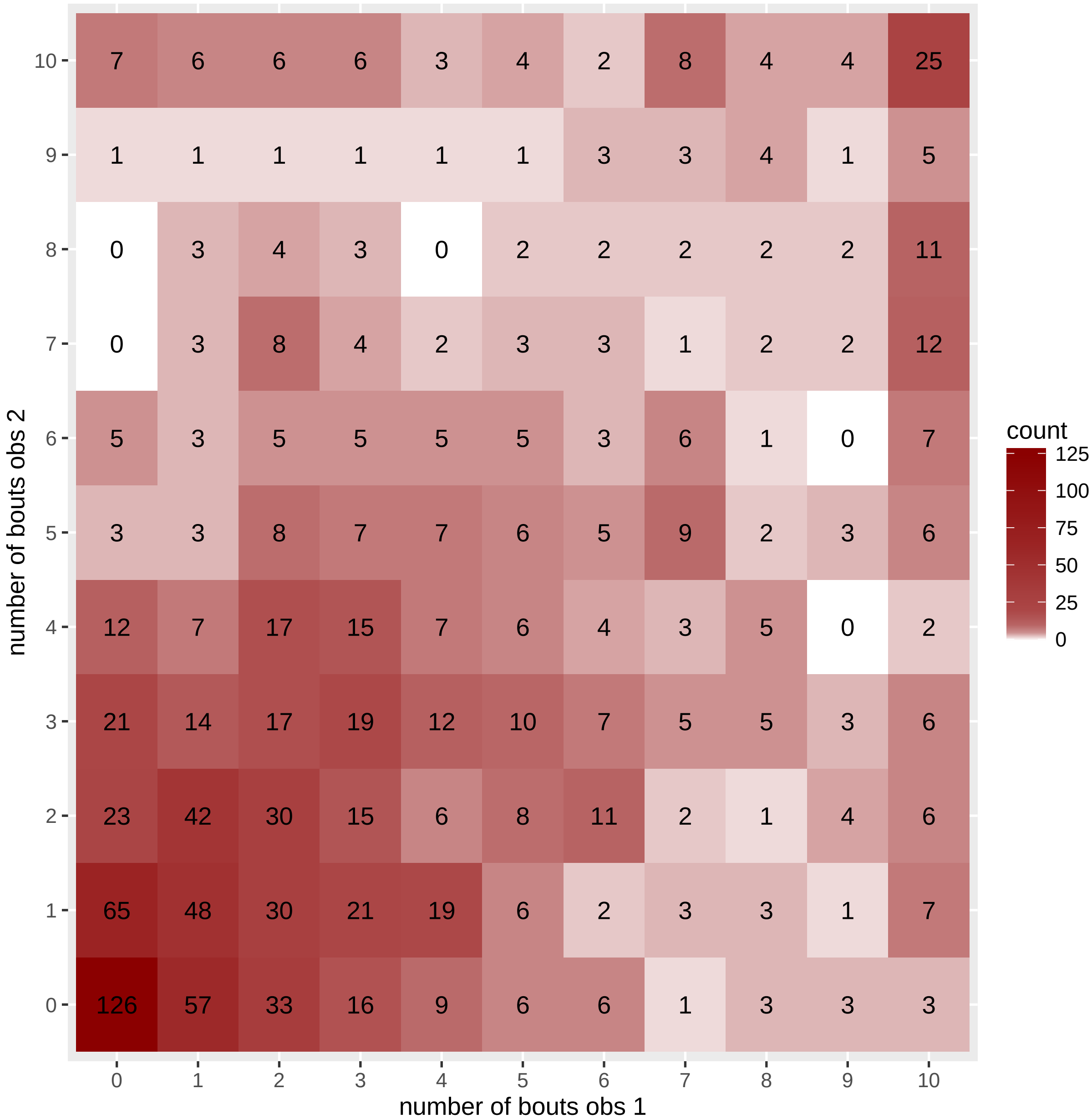
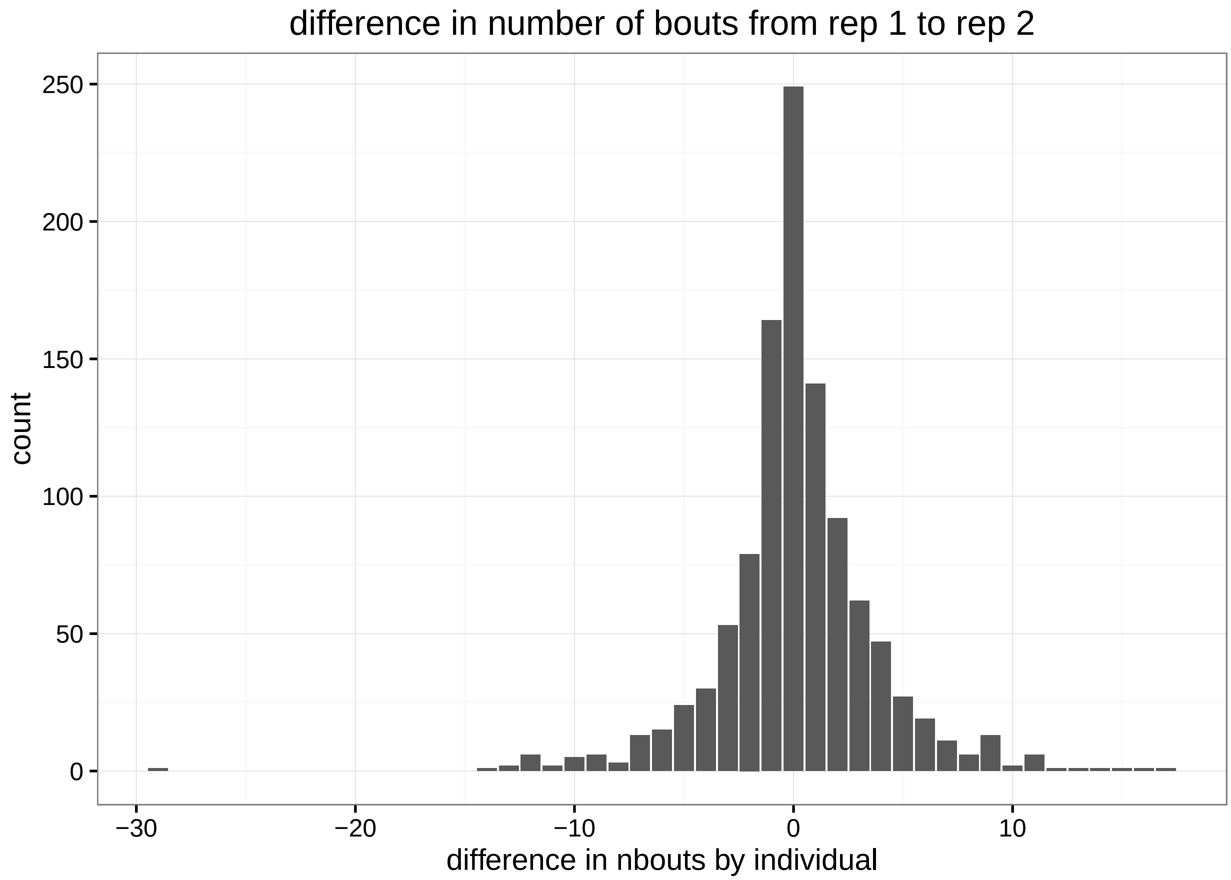
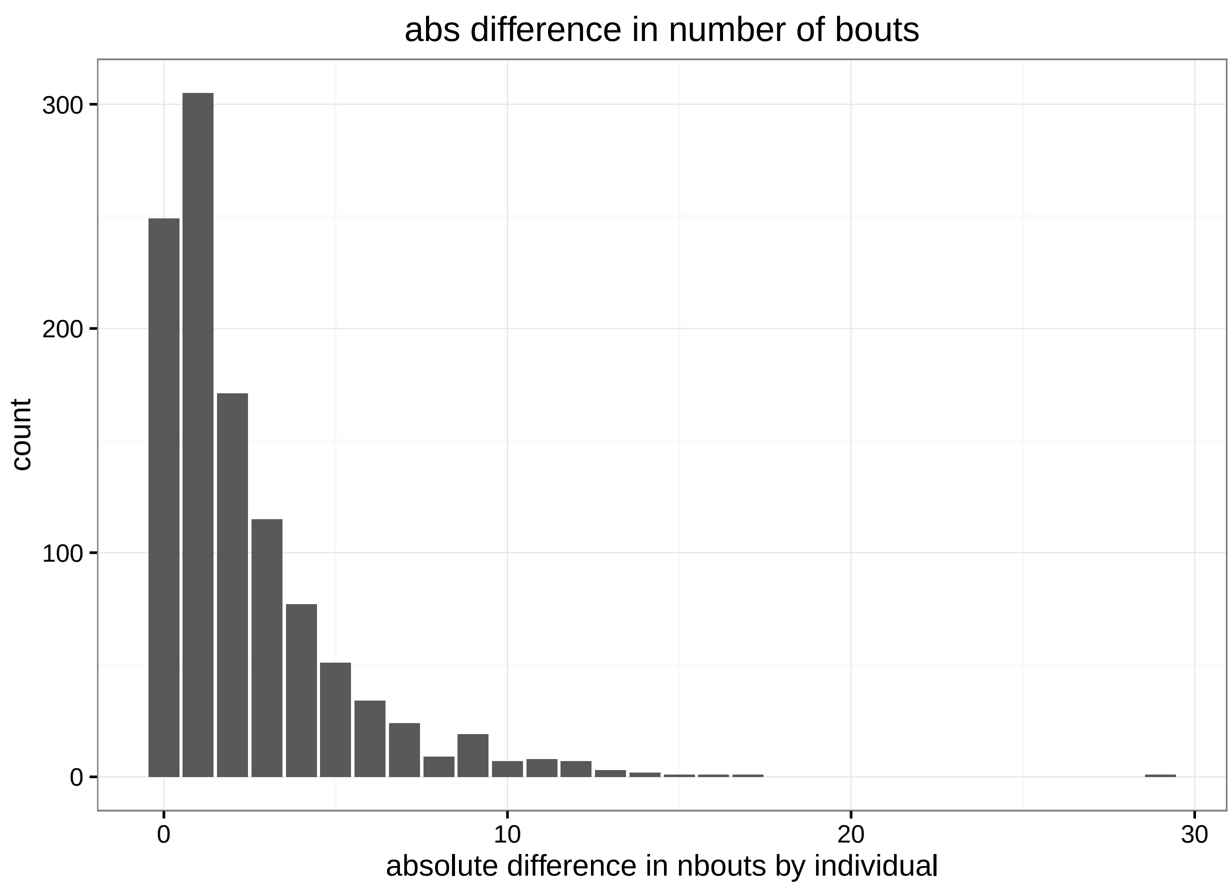
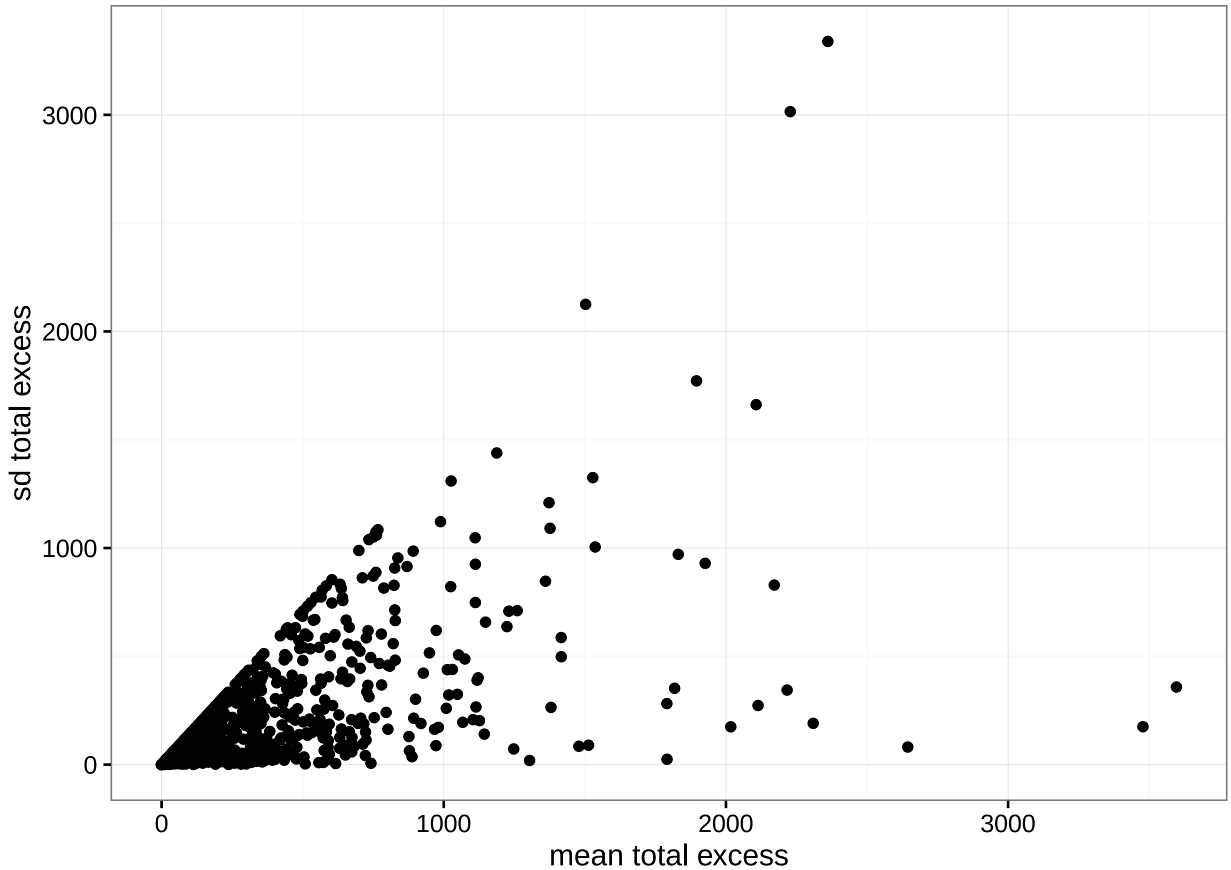


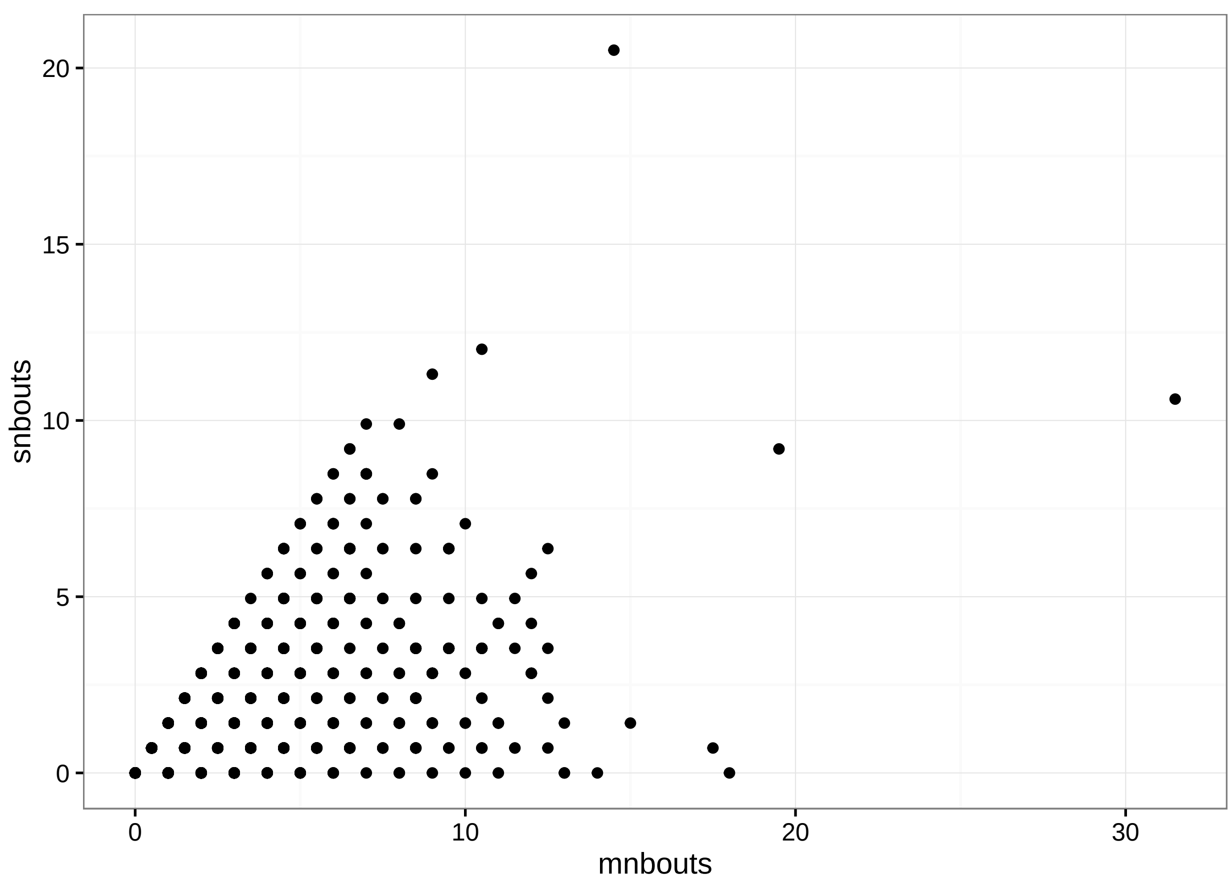
count
125
100
75
50
25
0
number of bouts obs 2
number of bouts obs 1
10: 7 6 6 6 3 4 2 8 4 4 25
9: 1 1 1 1 1 1 3 3 4 1 5
8: 0 3 4 3 0 2 2 2 2 2 11
7: 0 3 8 4 2 3 3 1 2 2 12
6: 5 3 5 5 5 5 3 6 1 0 7
5: 3 3 8 7 7 6 5 9 2 3 6
4: 12 7 17 15 7 6 4 3 5 0 2
3: 21 14 17 19 12 10 7 5 5 3 6
2: 23 42 30 15 6 8 11 2 1 4 6
1: 65 48 30 21 19 6 2 3 3 1 7
0: 126 57 33 16 9 6 6 1 3 3 3
0 1 2 3 4 5 6 7 8 9 10


difference in number of bouts from rep 1 to rep 2
count
250
200
150
100
50
0
−30
−20
−10
0
10
difference in nbouts by individual

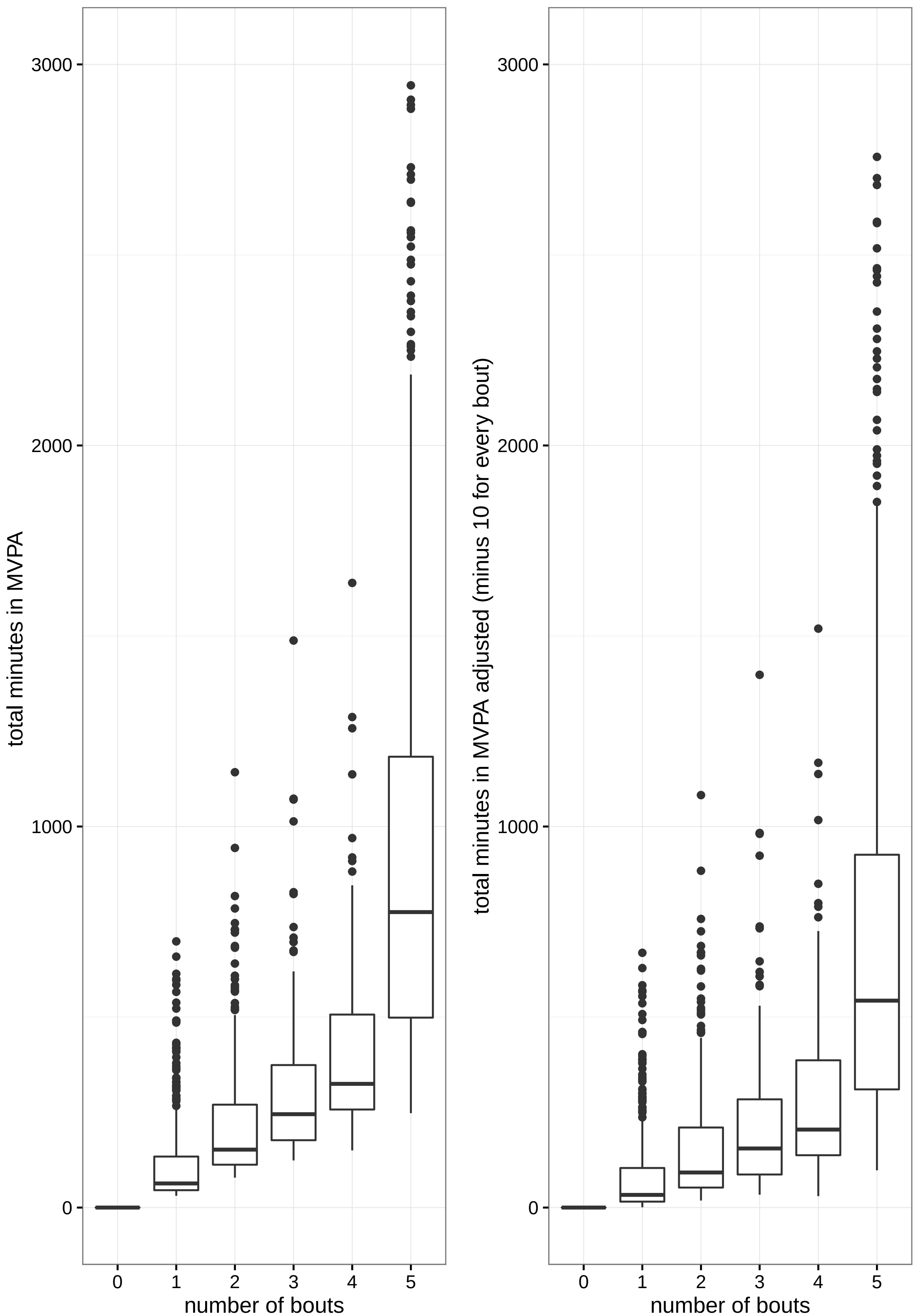

abs difference in number of bouts
count
300
200
100
0
0
10
20
30
absolute difference in nbouts by individual



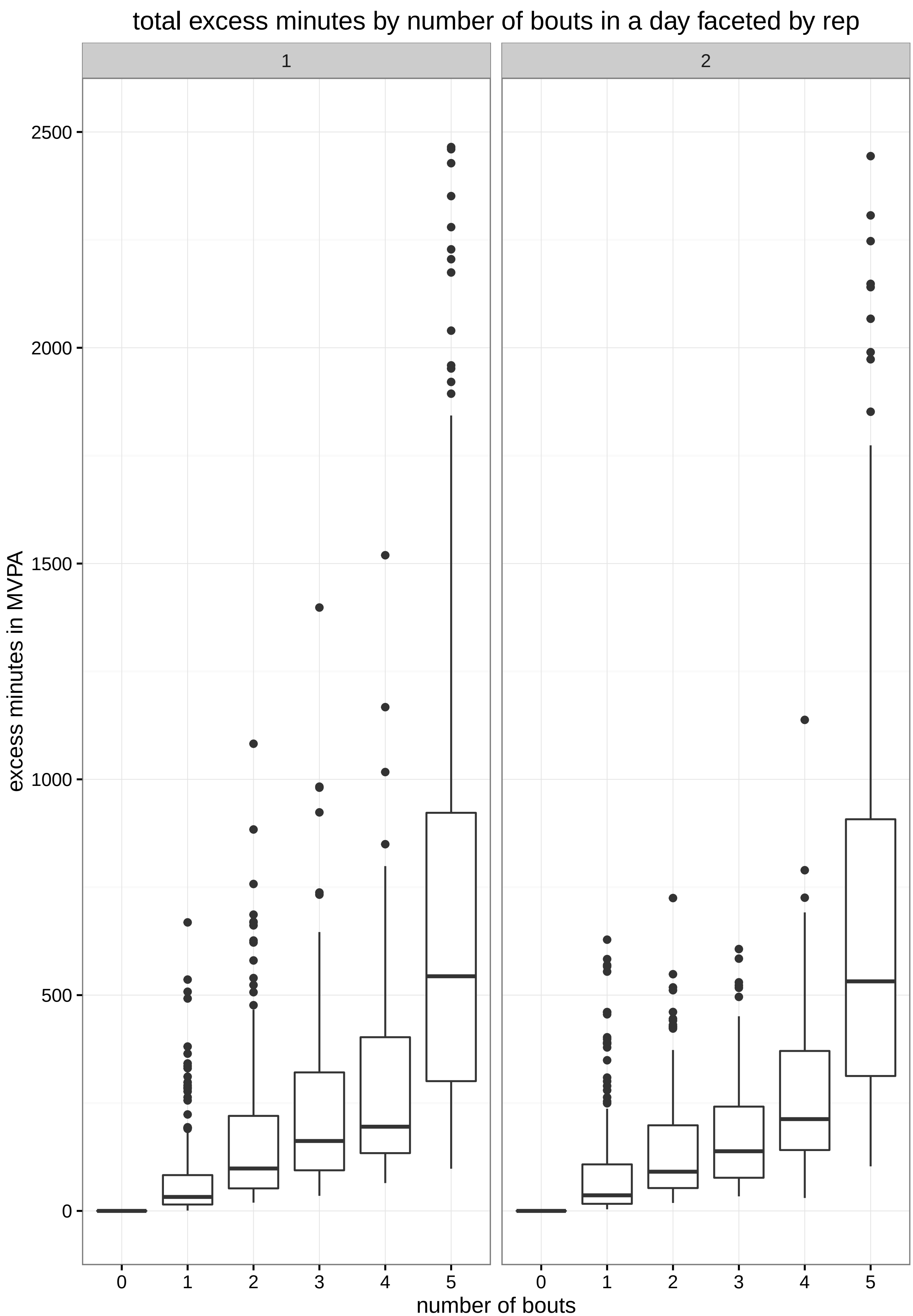
sd total excess
mean total excess
0
1000
2000
3000

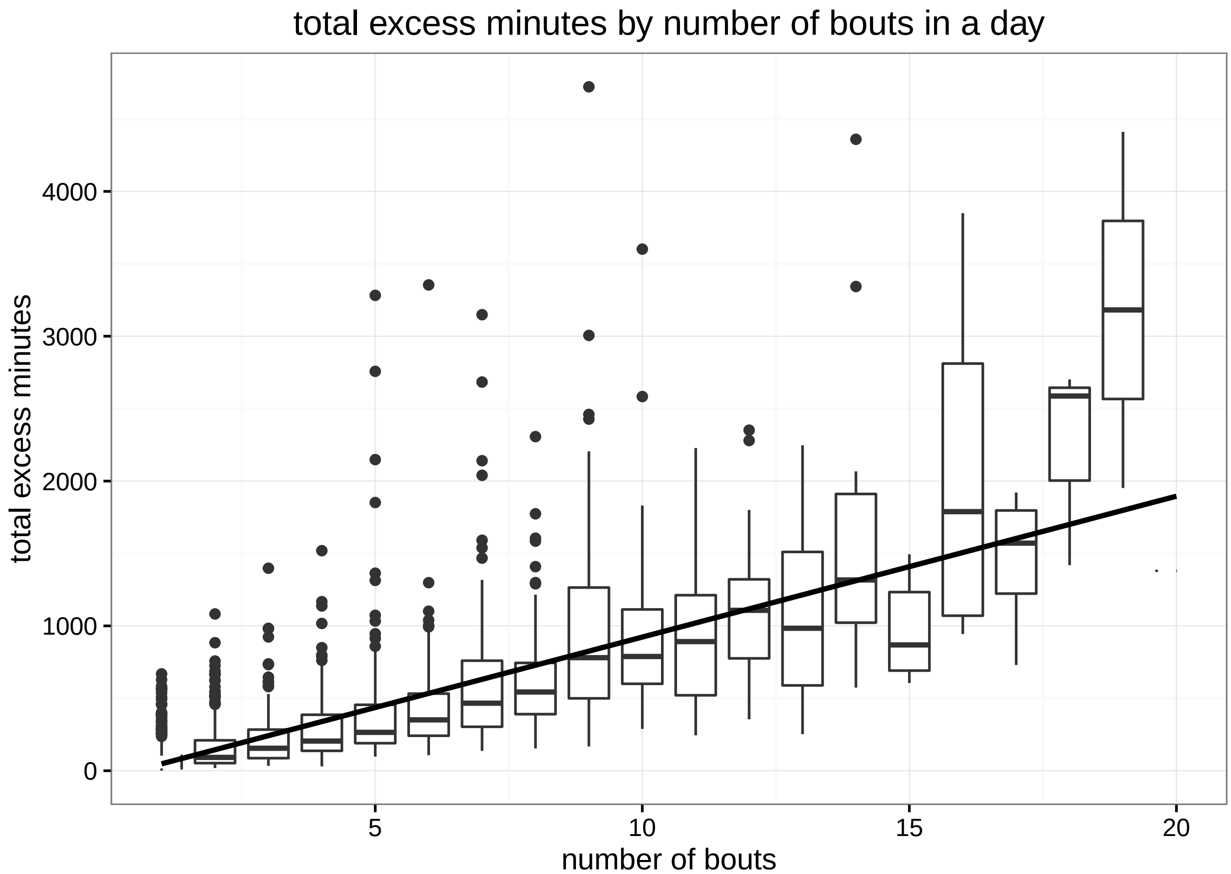


snbouts
mnbouts
0
5
10
15
20
30

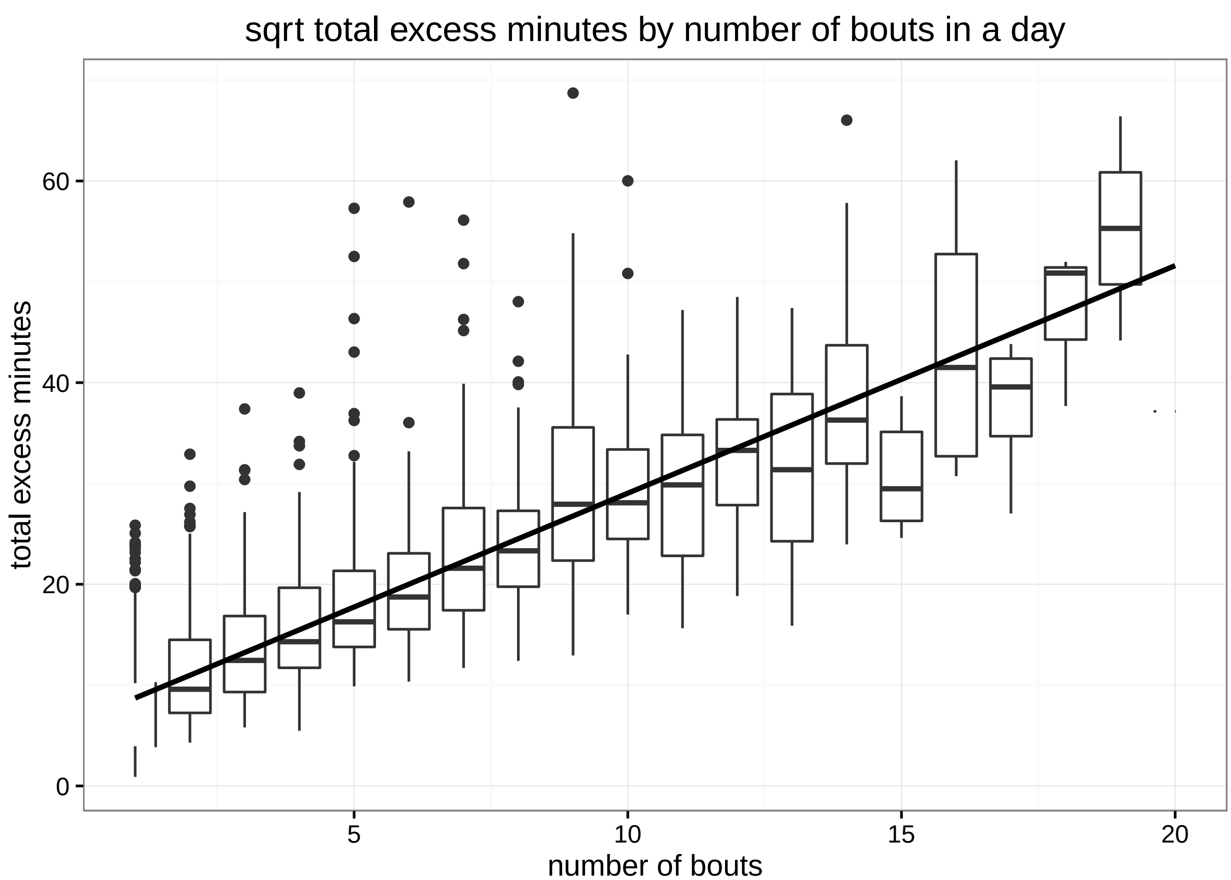


total minutes in MVPA
3000
2000
1000
0
0 1 2 3 4 5
number of bouts
total minutes in MVPA adjusted (minus 10 for every bout)
3000
2000
1000
0
0 1 2 3 4 5
number of bouts

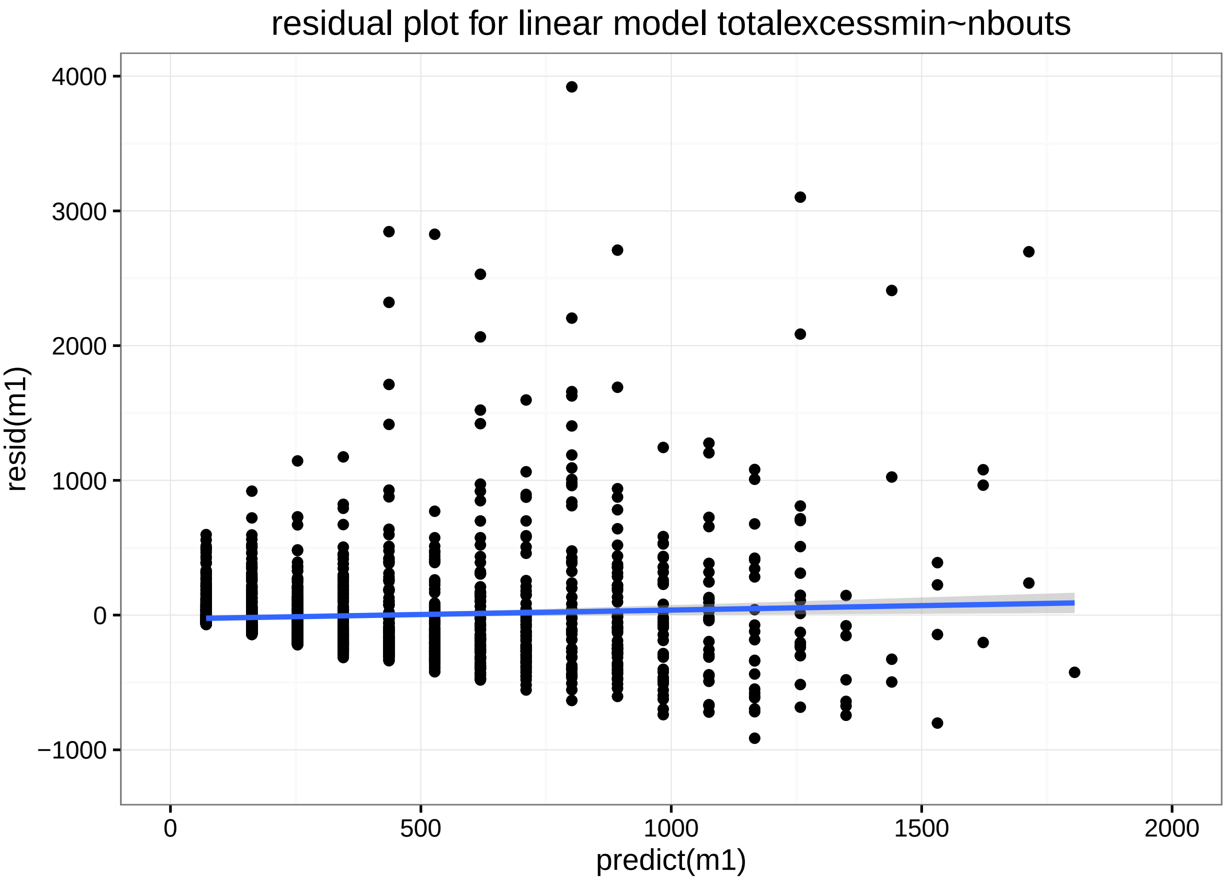

total excess minutes by number of bouts in a day faceted by rep
1
2
2500
2000
1500
1000
500
0
excess minutes in MVPA
0
1
2
3
4
5
number of bouts

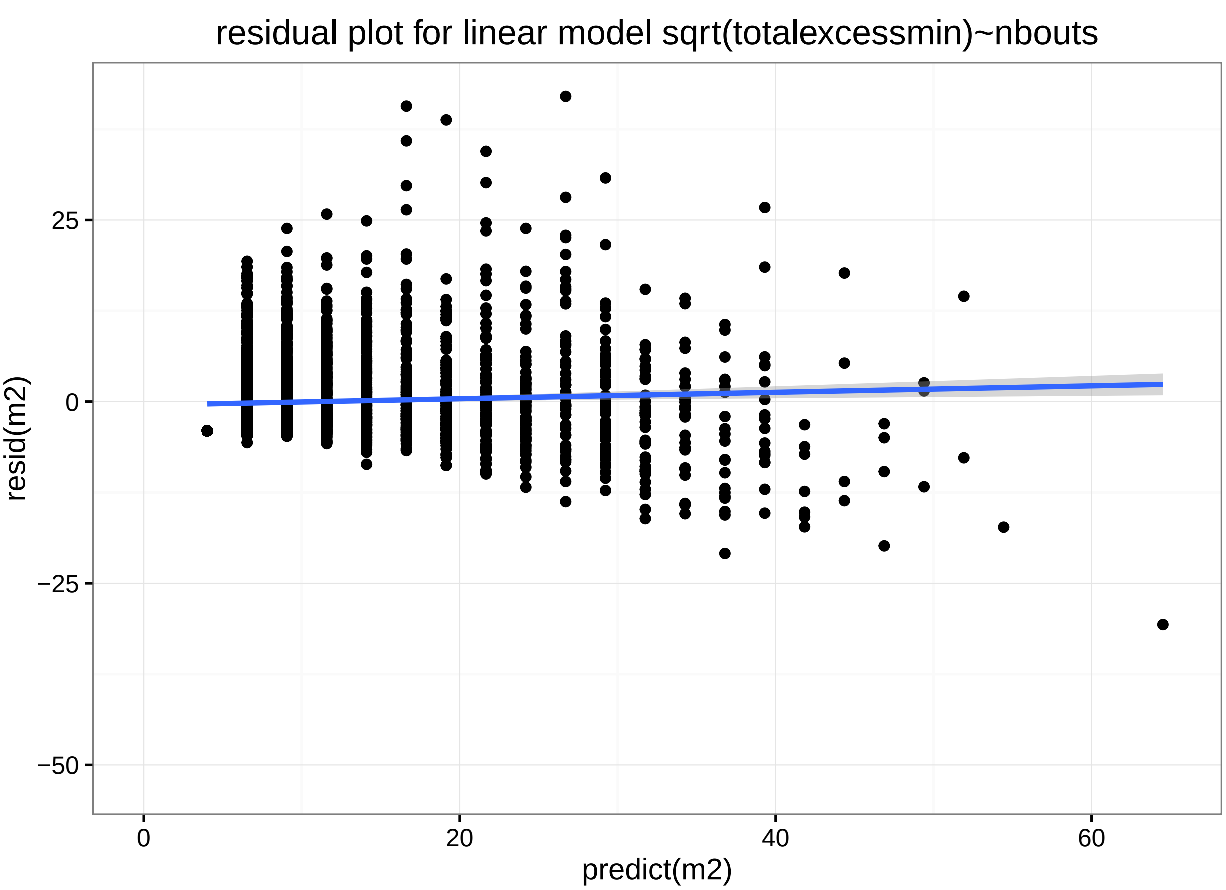


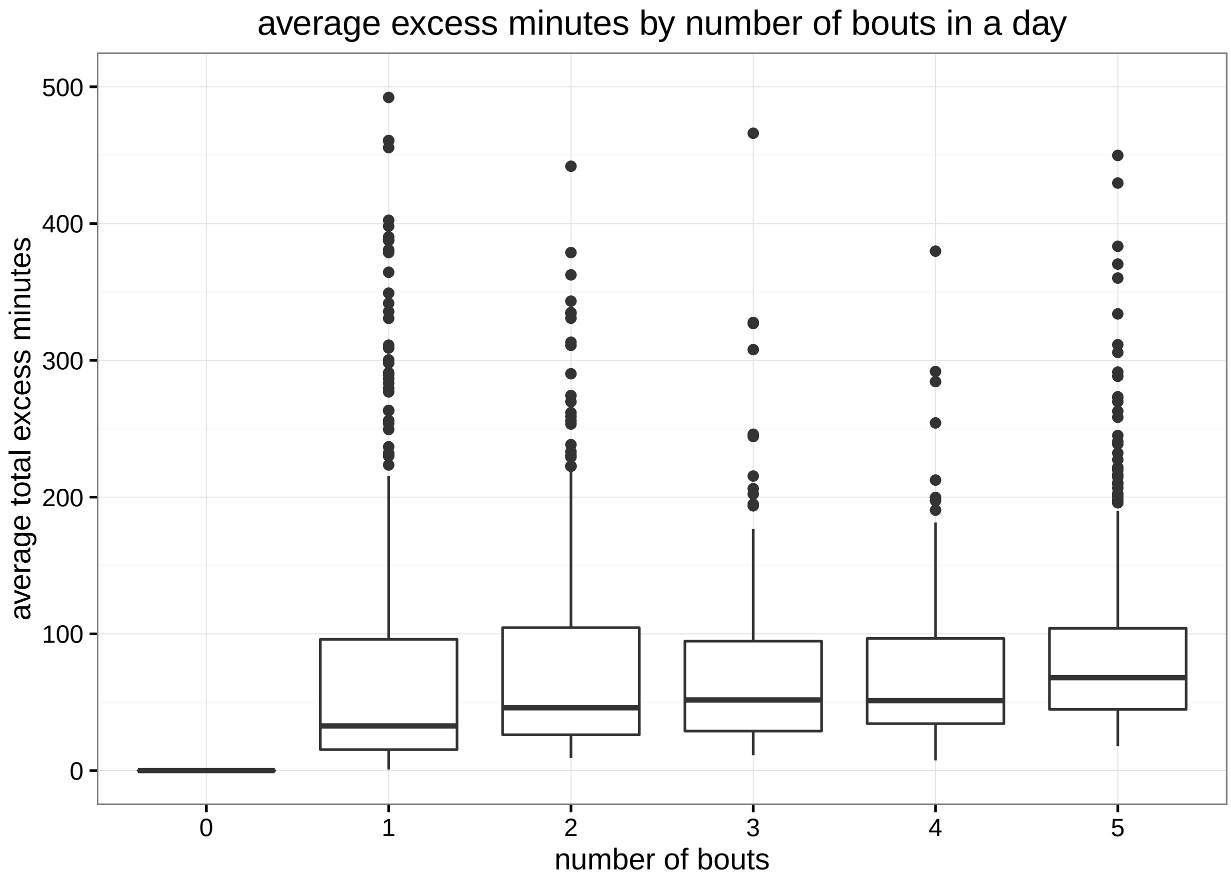
total excess minutes by number of bouts in a day
total excess minutes
0
1000
2000
3000
4000
5
10
15
20
number of bouts

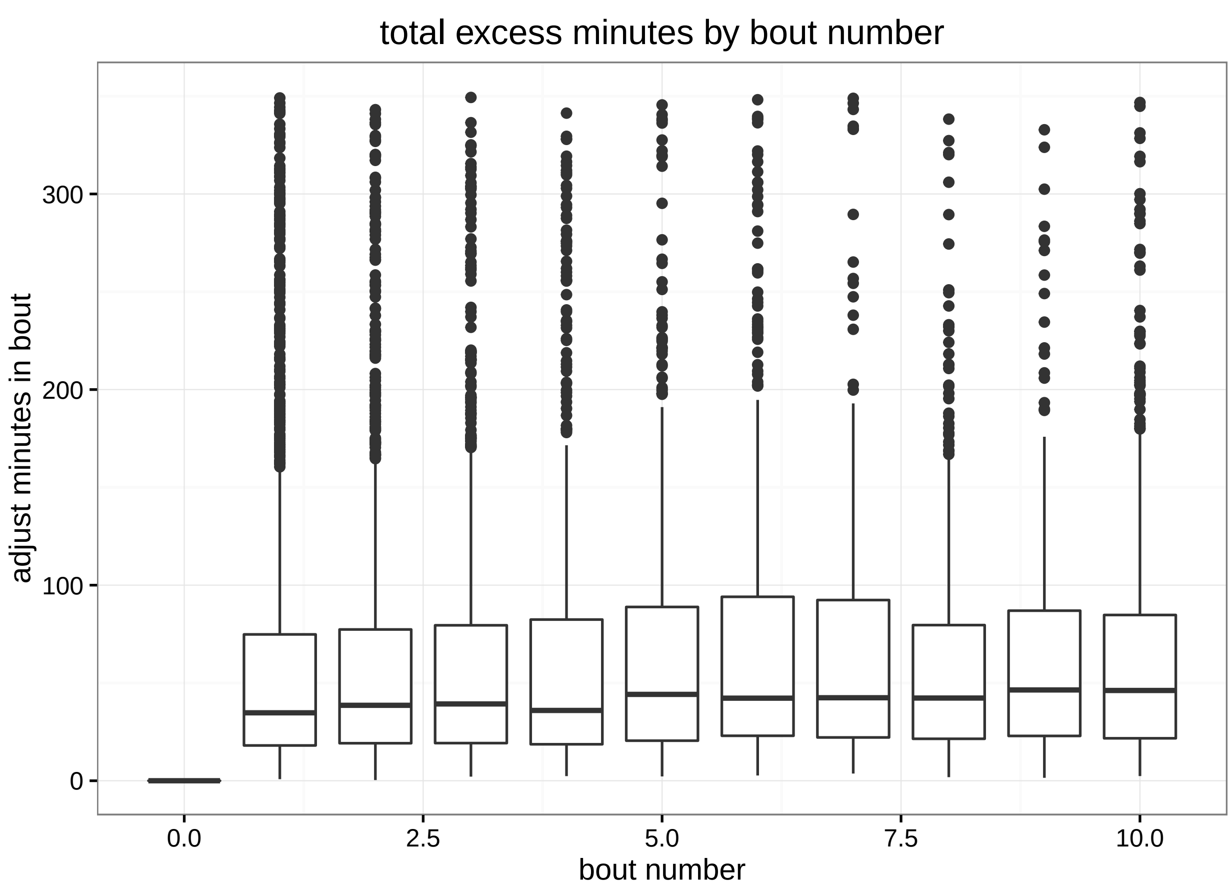


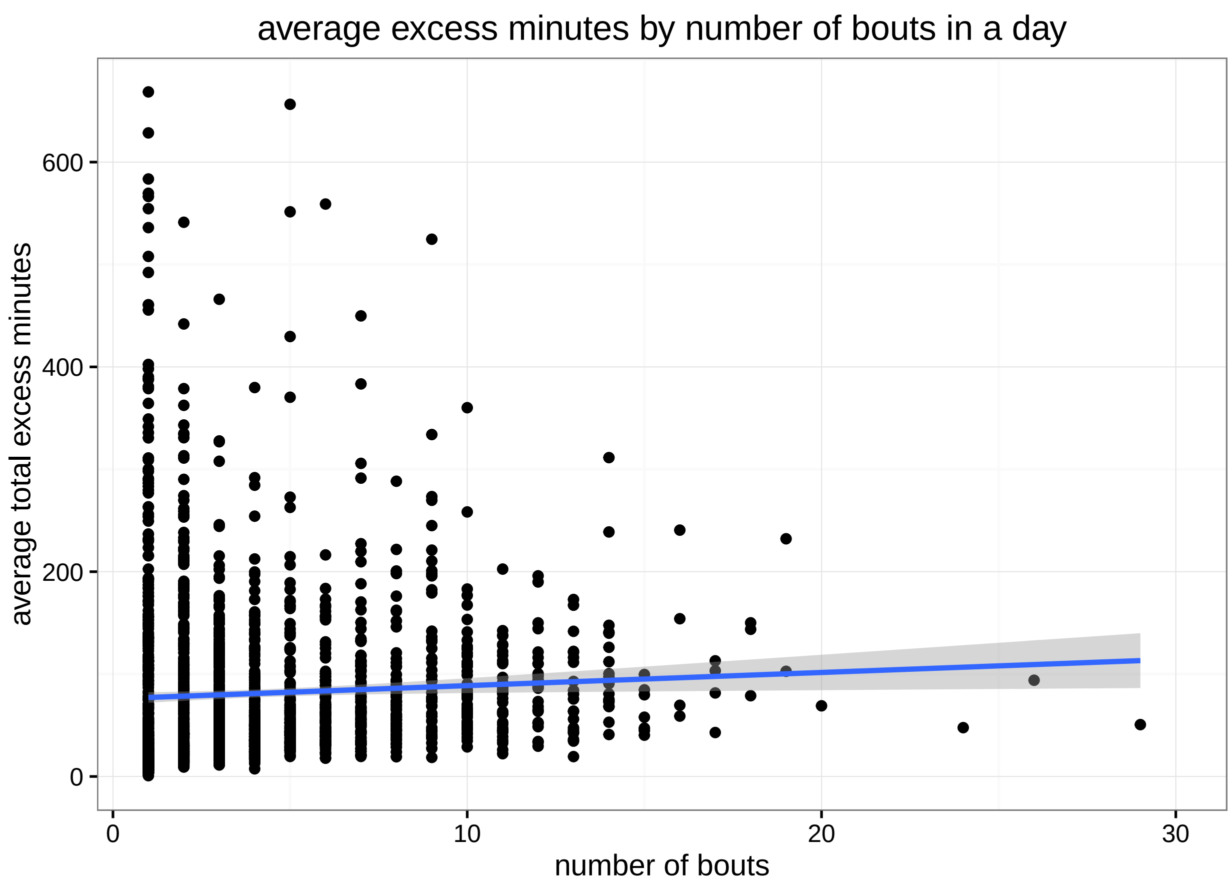
sqrt total excess minutes by number of bouts in a day
total excess minutes
0
20
40
60
5
10
15
20
number of bouts


residual plot for linear model totalexcessmin~nbouts
4000
3000
2000
1000
0
−1000
resid(m1)
0
500
1000
1500
2000
predict(m1)

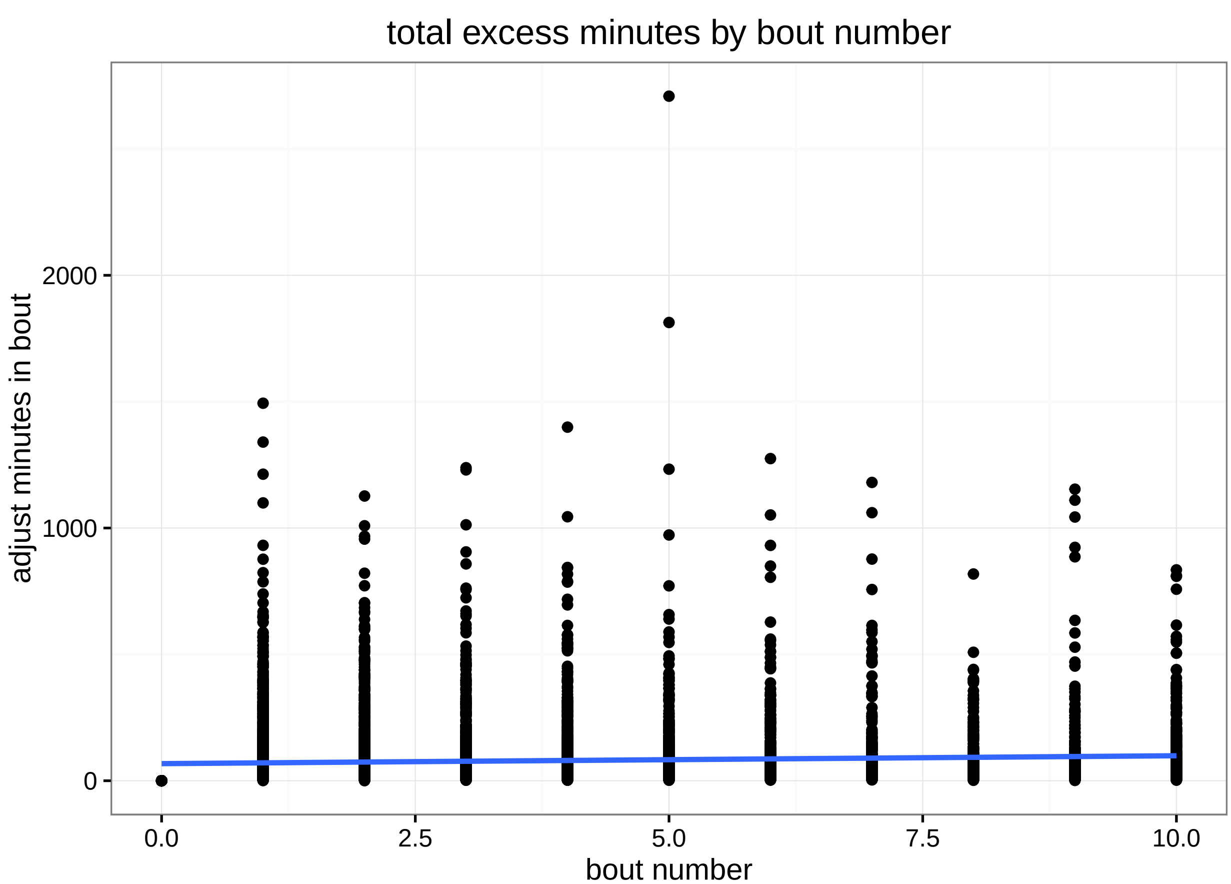

residual plot for linear model sqrt(totalexcessmin)~nbouts
25
0
−25
−50
resid(m2)
0
20
40
60
predict(m2)


average excess minutes by number of bouts in a day
average total excess minutes
0
100
200
300
400
500
0
1
2
3
4
5
number of bouts

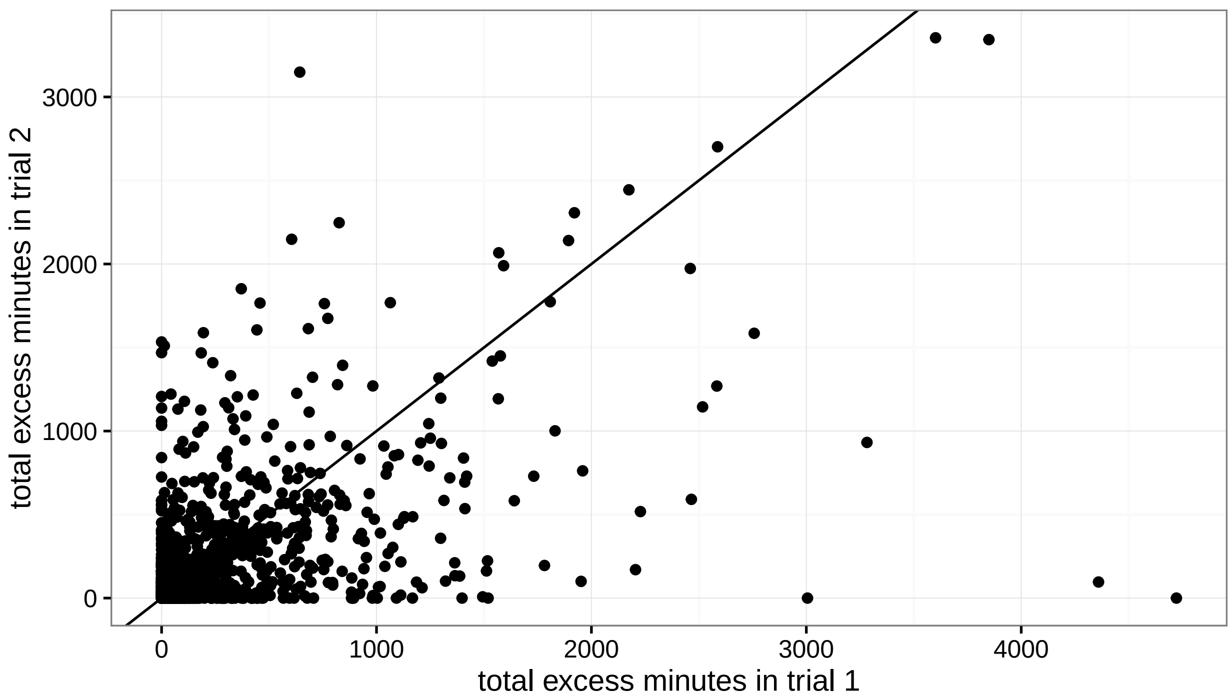

total excess minutes by bout number
adjust minutes in bout
0
100
200
300
0.0
2.5
5.0
7.5
10.0
bout number



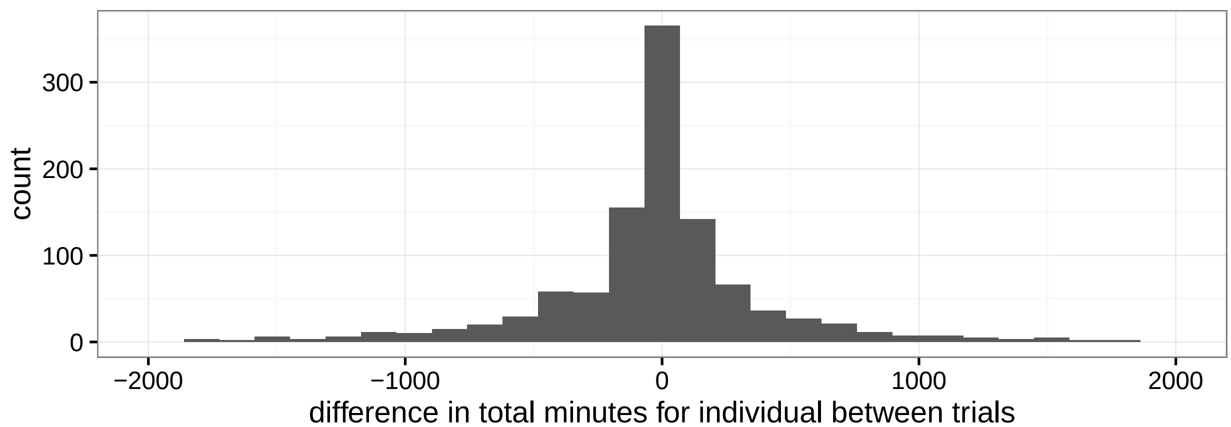
average excess minutes by number of bouts in a day
600
400
200
0
average total excess minutes
0
10
20
30
number of bouts



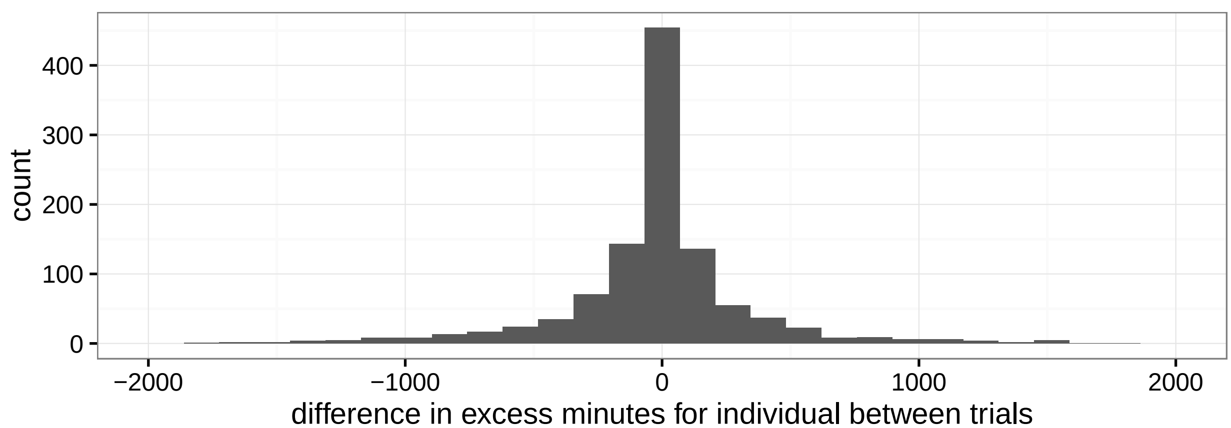
total excess minutes by bout number
2000
1000
0
adjust minutes in bout
0.0
2.5
5.0
7.5
10.0
bout number



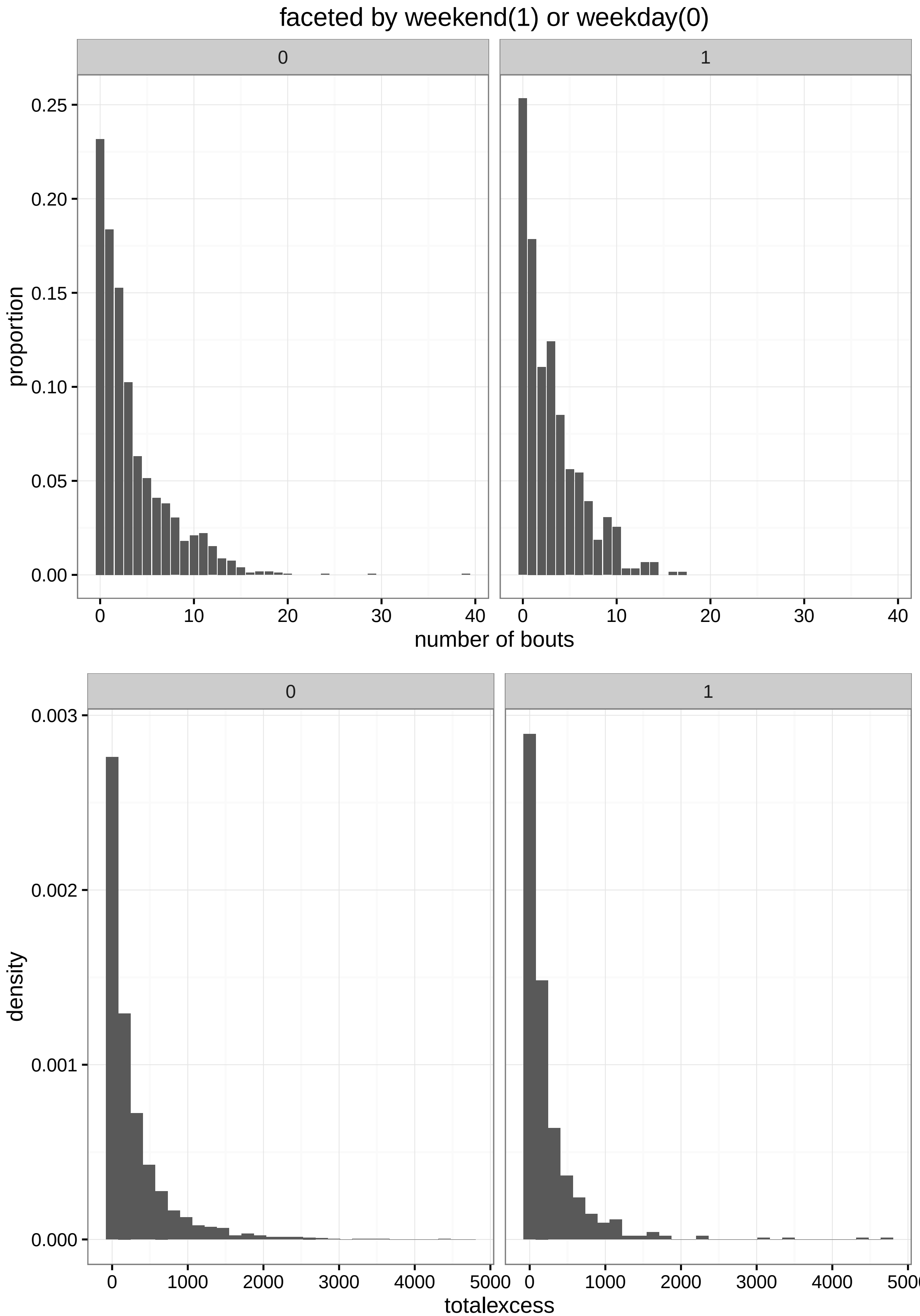
3000
2000
1000
0
total excess minutes in trial 2
0
1000
2000
3000
4000
total excess minutes in trial 1



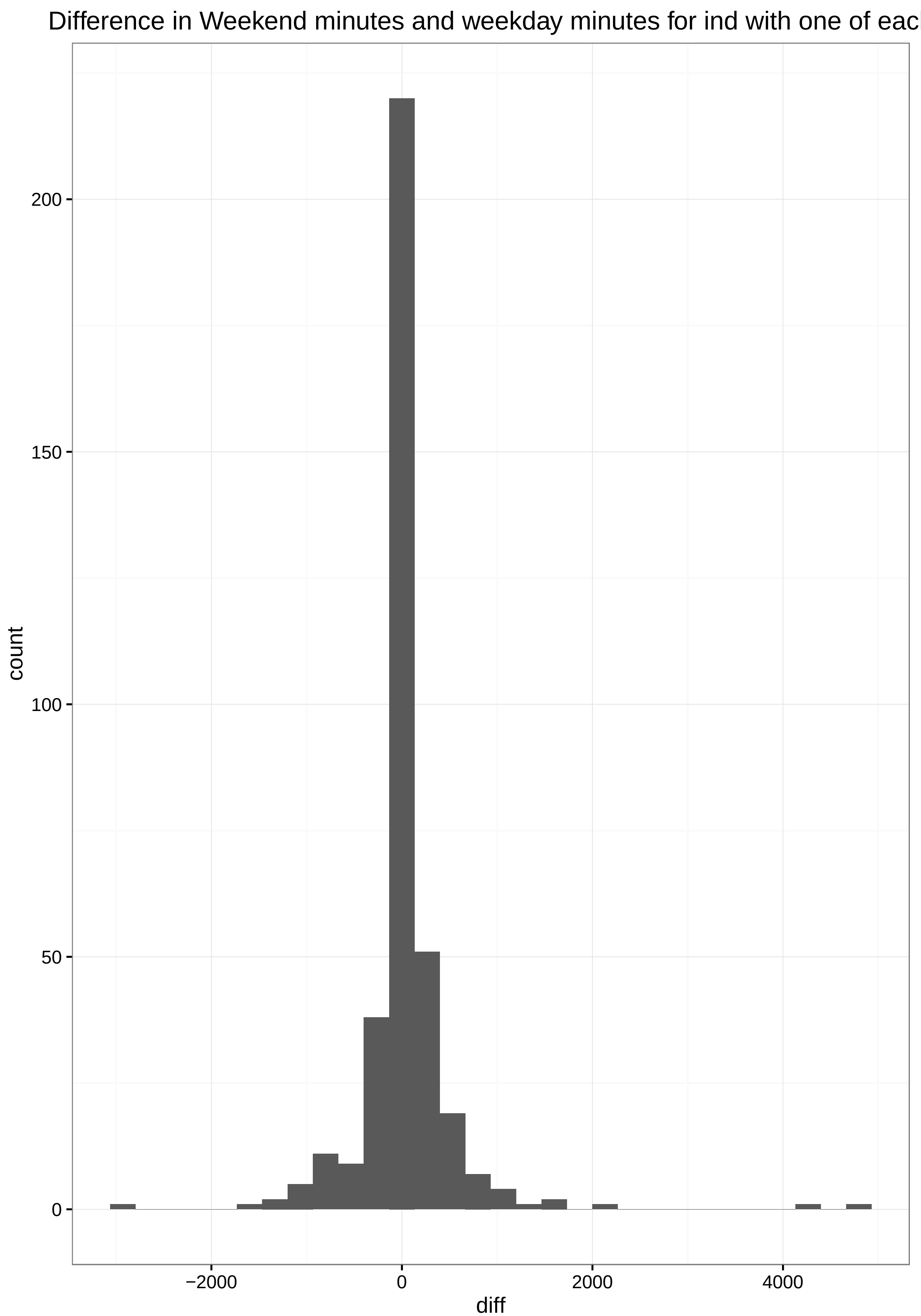
300
200
100
0
count
−2000
−1000
0
1000
2000
difference in total minutes for individual between trials



400
300
200
100
0
count
−2000
−1000
0
1000
2000
difference in excess minutes for individual between trials



faceted by weekend(1) or weekday(0)
0
1
proportion
0.25
0.20
0.15
0.10
0.05
0.00
0
10
20
30
40
number of bouts
density
0.003
0.002
0.001
0.000
0
1000
2000
3000
4000
5000
totalexcess


Difference in Weekend minutes and weekday minutes for ind with one of eac
count
200
150
100
50
0
−2000
0
2000
4000
diff

```r
#test difference in mean totalexcess min from trial 1 to trial 2 paired by individual
trial1 <- bouts %>% group_by(id) %>% filter(length((id))==2, rep==1)
trial2 <- bouts %>% group_by(id) %>% filter(length((id))==2, rep==2)

wilcox.test(trial1$totalexcess,trial2$totalexcess,paired=TRUE)
```

```
##
##  Wilcoxon signed rank test with continuity correction
##
## data:  trial1$totalexcess and trial2$totalexcess
## V = 245710, p-value = 0.07001
## alternative hypothesis: true location shift is not equal to 0
```

```r
#test difference in distribution of totalexcess min from trial 1 to trial 2
ks.test(bouts$totalexcess[bouts$rep==1],bouts$totalexcess[bouts$rep==2])
```

```
##
##  Two-sample Kolmogorov-Smirnov test
##
## data:  bouts$totalexcess[bouts$rep == 1] and bouts$totalexcess[bouts$rep == 2]
## D = 0.034009, p-value = 0.5031
## alternative hypothesis: two-sided
```

```r
#test difference in distribution of  differenced totalexcess min from trial 1 to trial 2 compa
a1 <- (trial2$totalexcess-trial1$totalexcess)
a2 <- (trial1$totalexcess-trial2$totalexcess)
ks.test(a1,a2)
```

```
##
##  Two-sample Kolmogorov-Smirnov test
##
```

```
## data:  a1 and a2
## D = 0.04977, p-value = 0.1361
## alternative hypothesis: two-sided
```

```
#difference in mean nbouts min from trial 1 to trial 2
wilcox.test(trial1$nbouts,trial2$nbouts,paired=TRUE)
```

```
##
##  Wilcoxon signed rank test with continuity correction
##
## data:  trial1$nbouts and trial2$nbouts
## V = 187960, p-value = 0.06021
## alternative hypothesis: true location shift is not equal to 0
```

```
#test marginal distributional differences in nbouts from trial 1 to trial 2
ks.test(bouts$nbouts[bouts$rep==1],bouts$nbouts[bouts$rep==2])
```

```
##
##  Two-sample Kolmogorov-Smirnov test
##
## data:  bouts$nbouts[bouts$rep == 1] and bouts$nbouts[bouts$rep == 2]
## D = 0.024617, p-value = 0.8674
## alternative hypothesis: two-sided
```

```
#nbouts of weekday vs weekend
ks.test(bouts$nbouts[bouts$Weekend==0],bouts$nbouts[bouts$Weekend==1])
```

```
##
##  Two-sample Kolmogorov-Smirnov test
##
## data:  bouts$nbouts[bouts$Weekend == 0] and bouts$nbouts[bouts$Weekend == 1]
```

```
## D = 0.042311, p-value = 0.4138
## alternative hypothesis: two-sided

#excess minutes of weekday vs weekend
ks.test(bouts$totalexcess[bouts$Weekend==0],bouts$totalexcess[bouts$Weekend==1])

##
##  Two-sample Kolmogorov-Smirnov test
##
## data:  bouts$totalexcess[bouts$Weekend == 0] and bouts$totalexcess[bouts$Weekend == 1]
## D = 0.062531, p-value = 0.06534
## alternative hypothesis: two-sided
```

```
#test difference in means of total excess in weekday vs weekend for those with both
week1weekend1 <- bouts %>% group_by(id) %>% filter(length((id))==2, sum(Weekend)==1, rep==1)
week1weekend2 <- bouts %>% group_by(id) %>% filter(length((id))==2, sum(Weekend)==1, rep==2)

wilcox.test(week1weekend1$totalexcess,week1weekend2$totalexcess,paired=TRUE)

##
##  Wilcoxon signed rank test with continuity correction
##
## data:  week1weekend1$totalexcess and week1weekend2$totalexcess
## V = 30118, p-value = 0.3099
## alternative hypothesis: true location shift is not equal to 0

#test difference in means of nbouts in weekday vs weekend for those with both
wilcox.test(week1weekend1$nbouts,week1weekend2$nbouts,paired=TRUE)

##
##  Wilcoxon signed rank test with continuity correction
##
```

```
## data:  week1weekend1$nbouts and week1weekend2$nbouts
## V = 22398, p-value = 0.3595
## alternative hypothesis: true location shift is not equal to 0
```

```
#test for difference in avg total excess mins by number of bouts
#nonparametric test since normality doesn't hold
kruskal.test(avgtotalexcess~nbouts,data=subset(bouts,nbouts>0))

##
##  Kruskal-Wallis rank sum test
##
## data:  avgtotalexcess by nbouts
## Kruskal-Wallis chi-squared = 136.9, df = 23, p-value < 2.2e-16

kruskal.test(avgtotalexcess~nbouts,data=subset(bouts,nbouts>0&nbouts<11))

##
##  Kruskal-Wallis rank sum test
##
## data:  avgtotalexcess by nbouts
## Kruskal-Wallis chi-squared = 101.37, df = 9, p-value < 2.2e-16
```

```
#linear trend on  avgtotalexcess minutes with nbouts as covariate
m1lm <- lm((avgtotalexcess)~(nbouts),data=subset(bouts,nbouts>0))
summary(m1lm)

##
## Call:
## lm(formula = (avgtotalexcess) ~ (nbouts), data = subset(bouts,
##     nbouts > 0))
##
```

```
## Residuals:
##    Min     1Q Median     3Q    Max
## -76.60 -50.48 -27.62  20.02 591.14
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  76.2126     2.9927  25.466   <2e-16 ***
## nbouts        1.1982     0.5323   2.251   0.0245 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 83.13 on 1808 degrees of freedom
## Multiple R-squared:  0.002795,Adjusted R-squared:  0.002243
## F-statistic: 5.067 on 1 and 1808 DF,  p-value: 0.02451
```

```
m1lmb <- lm((avgtotalexcess)~(nbouts),data=subset(bouts,nbouts>0&nbouts<11))
summary(m1lmb)
```

```
##
## Call:
## lm(formula = (avgtotalexcess) ~ (nbouts), data = subset(bouts,
##     nbouts > 0 & nbouts < 11))
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -75.86 -51.23 -29.87  19.85 591.88
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  75.1162     3.5804  20.980   <2e-16 ***
## nbouts        1.5505     0.8238   1.882     0.06 .
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 85.28 on 1675 degrees of freedom
## Multiple R-squared:  0.00211,Adjusted R-squared:  0.001515
## F-statistic: 3.542 on 1 and 1675 DF,  p-value: 0.05999
```

```
#test for diff in total excess mins by bout number
#nonparametric test since normality doesn't hold
kruskal.test(totalpadj~bout,data=subset(bybout,bout>0))
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  totalpadj by bout
## Kruskal-Wallis chi-squared = 50.569, df = 38, p-value = 0.08341
```

```
kruskal.test(totalpadj~bout,data=subset(bybout,bout>0&bout<11))
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  totalpadj by bout
## Kruskal-Wallis chi-squared = 23.959, df = 9, p-value = 0.004367
```

```
#linear trend on total excess minutes with bout number as covariate
m2lm <- lm(totalpadj~(bout),data=subset(bybout,bout>0))
summary(m2lm)
```

```
##
## Call:
```

```
## lm(formula = totalpadj ~ (bout), data = subset(bybout, bout >
##     0))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
##  -84.41  -64.84  -43.49    7.63 2623.50
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  84.4900     2.2689  37.238   <2e-16 ***
## bout          0.1463     0.4078   0.359     0.72
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 130.2 on 7706 degrees of freedom
## Multiple R-squared:  1.671e-05,Adjusted R-squared:  -0.0001131
## F-statistic: 0.1287 on 1 and 7706 DF,  p-value: 0.7197
```

```
m2lmb <- lm(totalpadj~(bout),data=subset(bybout,bout>0&bout<11))
summary(m2lmb)
```

```
##
## Call:
## lm(formula = totalpadj ~ (bout), data = subset(bybout, bout >
##     0 & bout < 11))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
##  -90.87  -65.00  -43.91    7.54 2621.49
##
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  80.8104     2.7105  29.814   <2e-16 ***
## bout          1.2850     0.6189   2.076   0.0379 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 131.7 on 7257 degrees of freedom
## Multiple R-squared:  0.0005938,Adjusted R-squared:  0.0004561
## F-statistic: 4.312 on 1 and 7257 DF,  p-value: 0.03789
```

```
#testing marginal homogeneity of 2 way table of nbouts
ct1 <- matrix(table(trial1$nbouts,trial2$nbouts)[1:10,1:10],nrow=10,byrow=T)
stuart.maxwell.mh(ct1[1:6,1:6])
```

```
##  Stuart-Maxwell marginal homogeneity
##
##  Subjects = 584
##    Raters = 2
##     Chisq = 1.39
##
##  Chisq(4) = 1.39
##   p-value = 0.845
```

```
stuart.maxwell.mh(ct1)
```

```
##  Stuart-Maxwell marginal homogeneity
##
##  Subjects = 845
##    Raters = 2
##     Chisq = 4.54
##
```

```
##  Chisq(8) = 4.54
##   p-value = 0.805
```

```
#Bowker's test of symmetry, ie. generalization of McNemar's test
mcnemar.test(ct1[1:6,1:6])
```

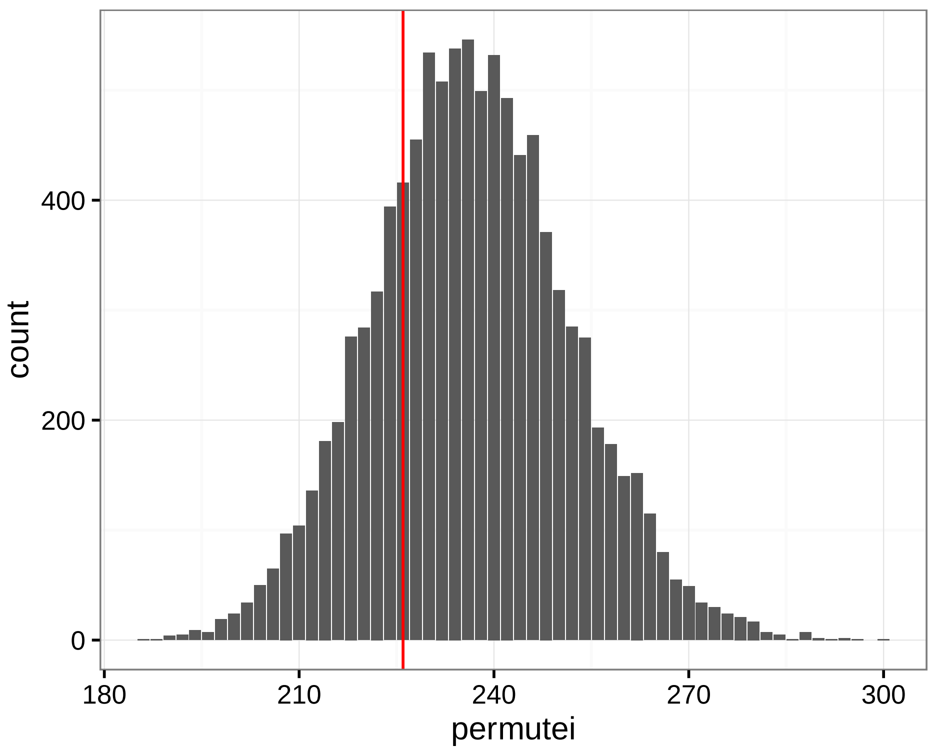
```
##
##  McNemar's Chi-squared test
##
## data:  ct1[1:6, 1:6]
## McNemar's chi-squared = 20.679, df = 15, p-value = 0.1474
```

```
mcnemar.test(ct1)
```

```
##
##  McNemar's Chi-squared test
##
## data:  ct1
## McNemar's chi-squared = 52.875, df = 45, p-value = 0.1961
```

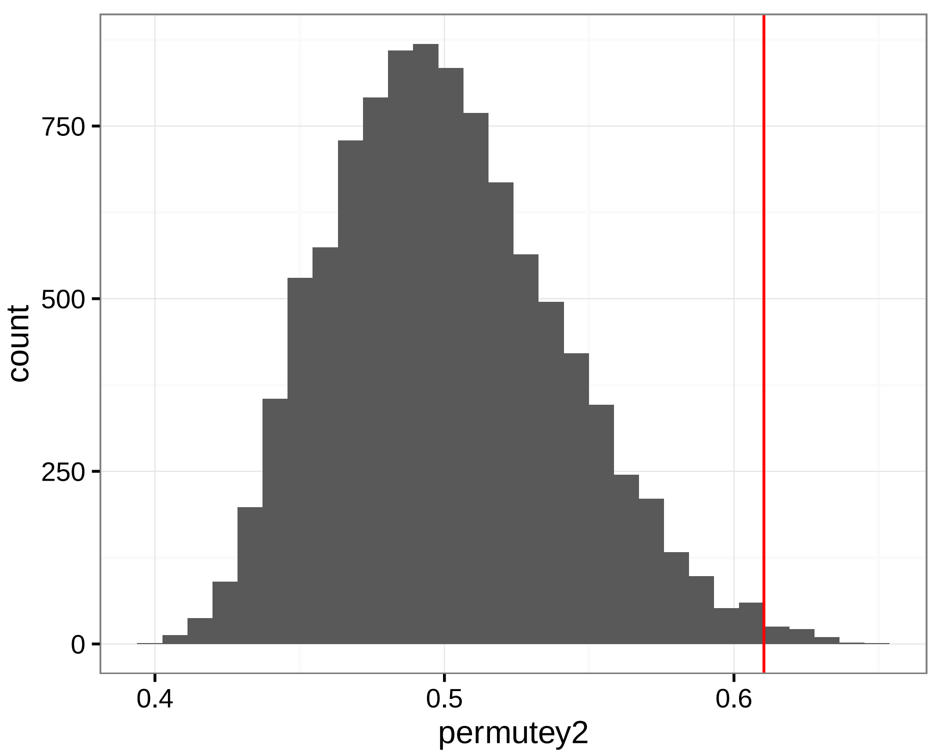
```
#permutation test
#H_0 : sum |lower.tri-upper.tri|  = 0, ie. trial 1 and trial 2 exchangeable
# H_a : sum > 0, not exchangeable
obs <- sum(abs(ct1[lower.tri(ct1)]-ct1[upper.tri(ct1)]))
nsim <- 10000
permutei <- rep(0,nsim)
nboutmat <- cbind(trial1$nbouts,trial2$nbouts)
newmat <- matrix(0,nrow=nrow(nboutmat),ncol=ncol(nboutmat))
for(i in 1:nsim){
  for(j in 1:nrow(nboutmat)){
    s <- sample(1:2,2)
```

```
    newmat[j,s[1]] <- nboutmat[j,1]
    newmat[j,s[2]] <- nboutmat[j,2]
  }
  cti <- matrix(table(newmat[,1],newmat[,2])[1:10,1:10],ncol=10,byrow=T)
  #mat <- ct1[sample(nrow(ct1)),sample(ncol(ct1))]
  permutei[i] <- sum(abs(cti[lower.tri(cti)]-cti[upper.tri(cti)]))
}

qplot(x=permutei,geom="bar") + geom_vline(xintercept=obs,col="red") + theme_bw()
```

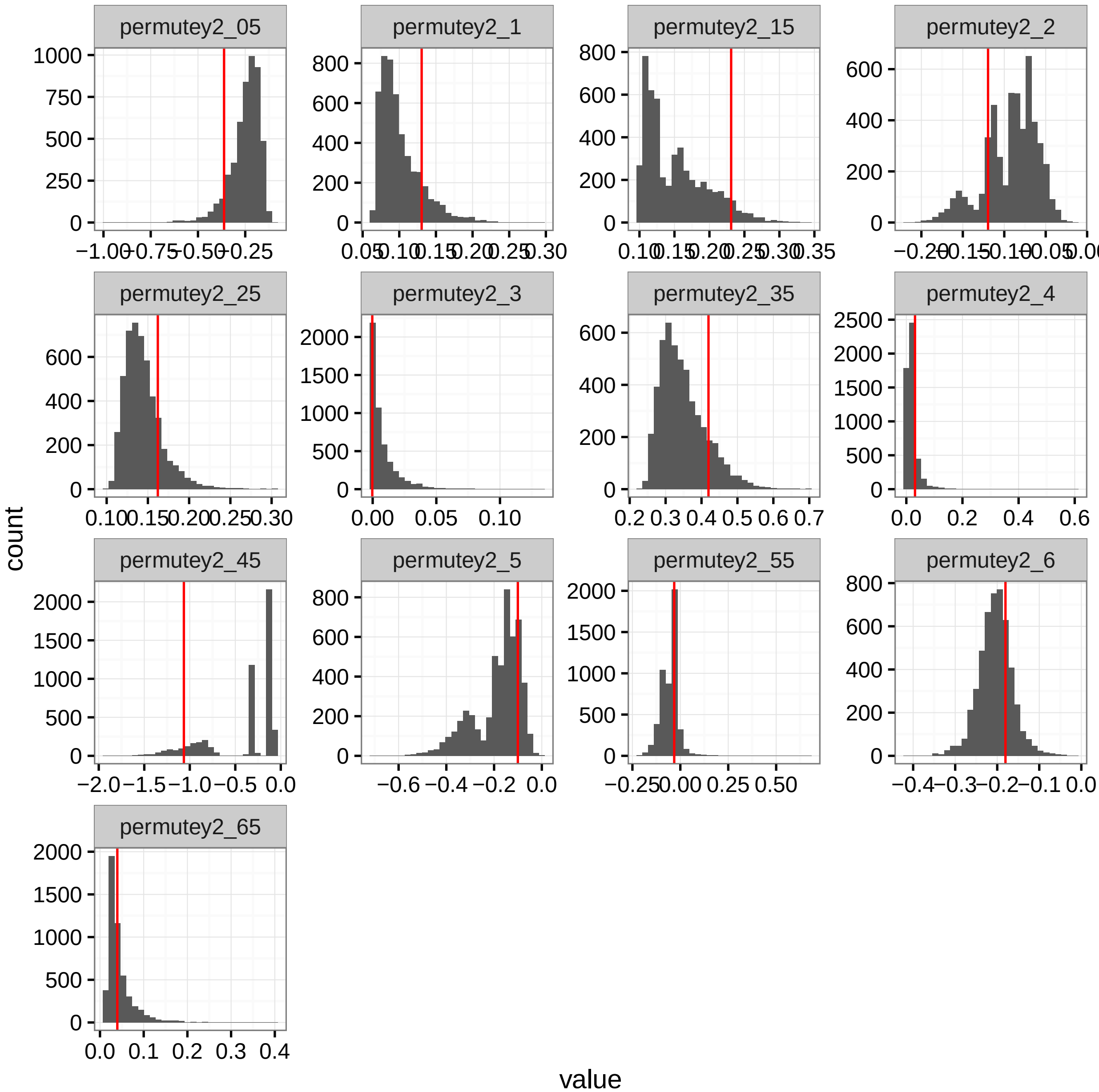



```
#checking exchangeability for y2 total excess minutes
#or like this? instead permute obs from trial 1 and trial 2?
#obsy2 <- sum(trial1£totalexcess-trial2£totalexcess)#cor(trial1£totalexcess,trial2£totalexcess,
obsy2 <- coef(lm(trial1$totalexcess~trial2$totalexcess))[2]
nsim <- 10000
permutey2 <- rep(0,nsim)
nboutmaty2 <- cbind(trial1$totalexcess,trial2$totalexcess)
```

```r
newmaty2 <- matrix(0,nrow=nrow(nboutmaty2),ncol=ncol(nboutmaty2))
for(i in 1:nsim){
  for(j in 1:nrow(nboutmaty2)){
    s <- sample(1:2,2)
    newmaty2[j,s[1]] <- nboutmaty2[j,1]
    newmaty2[j,s[2]] <- nboutmaty2[j,2]
  }

  #permutey2[i] <- sum(newmaty2[,1]-newmaty2[,2])#cor(newmaty2)[1,2]
  permutey2[i] <- coef(lm(newmaty2[,1]~newmaty2[,2]))[2]#cor(newmaty2)[1,2]

}

qplot(x=permutey2) + geom_vline(xintercept=obsy2,col="red") + theme_bw()

## `stat_bin()` using `bins = 30`.  Pick better value with `binwidth`.
```



```
## 'stat_bin()' using 'bins = 30'.  Pick better value with 'binwidth'.
```




```
##  [1] 0.0800 0.8566 0.9380 0.1660 0.8268 0.1682 0.8546 0.8466 0.0844 0.8180
## [11] 0.7664 0.7506 0.5918
```