Intro to Heart Rate

Corey Kimzey

2017-10-11

Description

This package is used to do analysis on some resting heart rate data I have been collecting. It creates target heart ranges for excersing. Also it compares heart rate to it's moving average. The package also tries to fit some linear models.

```
library(knitr)
library(heartrate)
library(googlesheets)
library(tidyverse)
library(forecast)
```

Here are some examples of what you can do with my packages and some basic analysis:

sample Dataset

I created a sample dataset. It has the first 21 days of data that I collected. Here is just the first couple of rows:

```
data("ckheartRate")
head(ckheartRate)
```

```
##   Day Resting Heart Rate Time in Min Miles walking Inf Computing
## 1   1                 41          NA          3.30   4         1
## 2   2                 60          NA          1.80   4         2
## 3   3                 76          NA          1.90   2         2
## 4   4                 81          NA          3.00   1         2
## 5   5                 72          NA          0.55   2         1
## 6   6                 78          NA          0.96   3         1
##   Probability Estimated Sleep Hrs on Hwk
## 1           0             7.0          5
## 2           0             7.5          6
## 3           1             7.0          5
## 4           1             7.0          4
## 5           1             8.0          4
## 6           0             9.0          4
```

Updating Dataset

I created a function that will automatically pull in the newest data. It is called updating_heartRate. This is useful so that I can continually use the function to update my data.

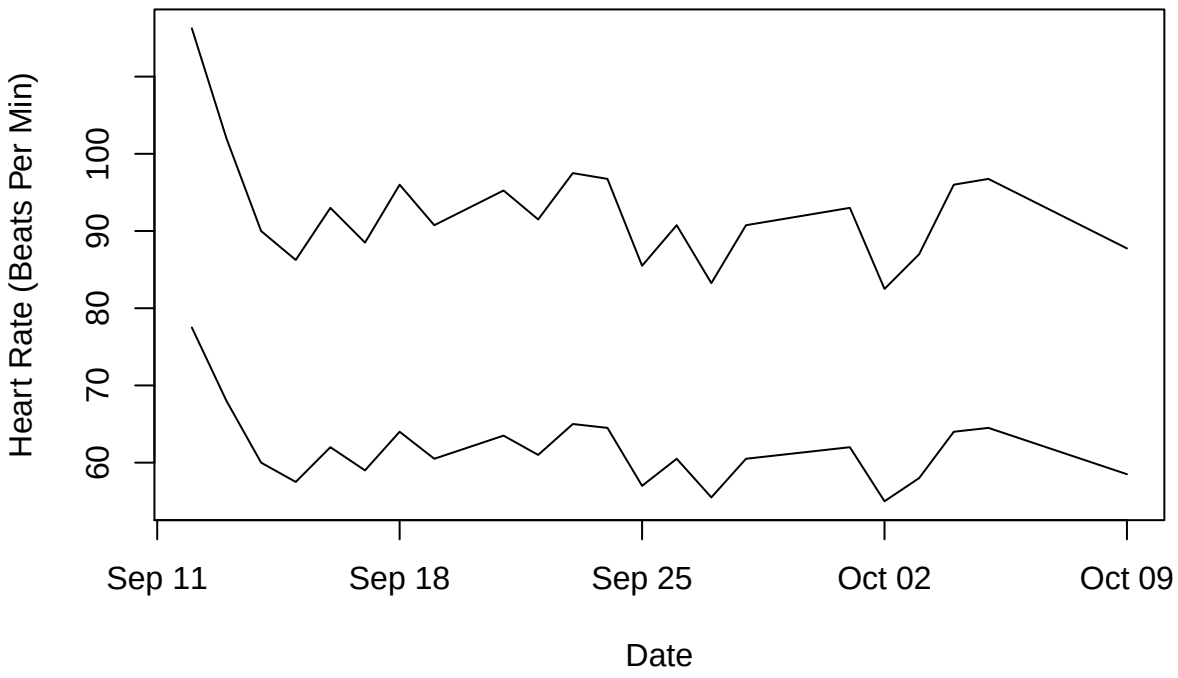
```
tester <- updating_heartRate()
tester
```

```
## # A tibble: 28 x 10
##          Date   Day `Resting Heart Rate` `Time in Min` `Miles walking`
##        <date> <int>                <int>         <lgl>           <dbl>
##  1 2017-09-12     1                   41            NA            3.30
##  2 2017-09-13     2                   60            NA            1.80
##  3 2017-09-14     3                   76            NA            1.90
##  4 2017-09-15     4                   81            NA            3.00
##  5 2017-09-16     5                   72            NA            0.55
##  6 2017-09-17     6                   78            NA            0.96
##  7 2017-09-18     7                   68            NA            1.80
##  8 2017-09-19     8                   75            NA            1.80
##  9 2017-09-20     9                   NA            NA            1.90
## 10 2017-09-21    10                   69            NA            2.60
## # ... with 18 more rows, and 5 more variables: `Inf` <dbl>,
## #   Computing <dbl>, Probability <dbl>, `Estimated Sleep` <dbl>, `Hrs on
## #   Hwk` <dbl>
```

target_ranges

I created a function that will create target work out ranges based off https://www.active.com/fitness/articles/how-to-calculate-your-training-heart-rate-zones. I think this could be useful if I tracked my heart rate during work outs I could see if my heart rates during the work out were in my target heart range. Here is an example of that:

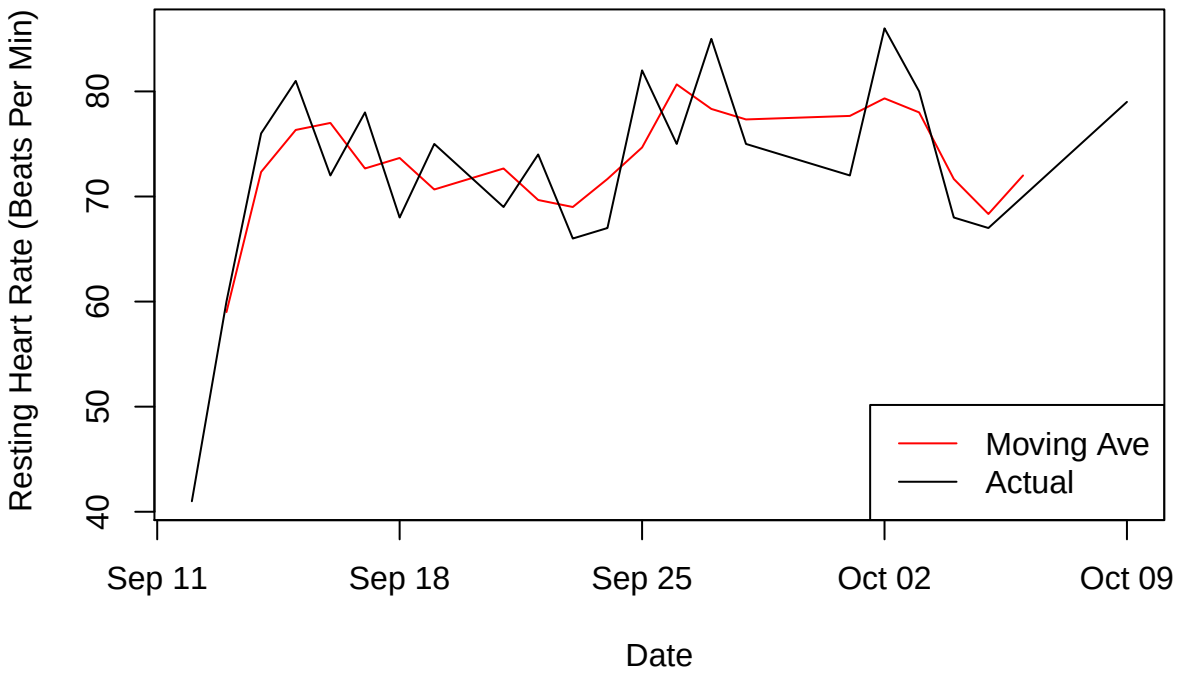
```
ranged <- target_ranges(tester$`Resting Heart Rate`, time_data = tester$Date, age = 24)
plot(ranged[,1], ranged[,2], type = "l", ylim = c(min(ranged[,2]),
                                                  max(ranged[,3])),
     xlab = "Date",
     ylab = "Heart Rate (Beats Per Min)" )
lines(ranged[,1], ranged[,3], type = "l")
```



stress_plot

I created a function that imediately plots the difference between the actual data and a moving average. This would allow one to see if they seem to be above their moving average. My data for the most part seems to be pretty much the same (it might be increasing slightly) except the first data point was really low. The first data point is really low because I was using a heart rate monitor that I think is broken.

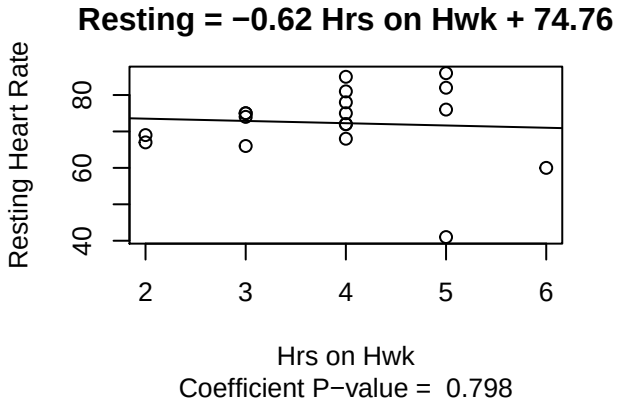
```
plot_stressed(tester$`Resting Heart Rate`, tester$Date, xlab = "Date",
              ylab = " Resting Heart Rate (Beats Per Min)")
```

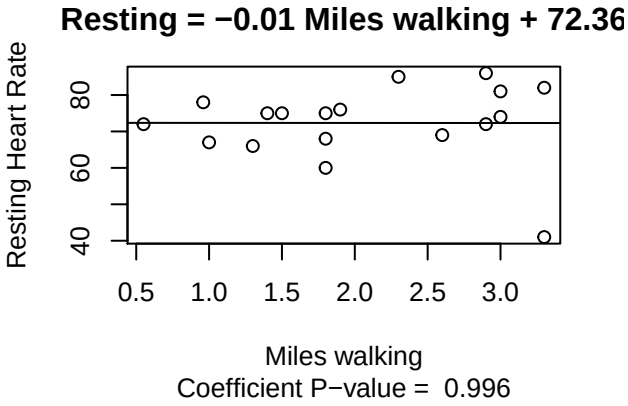


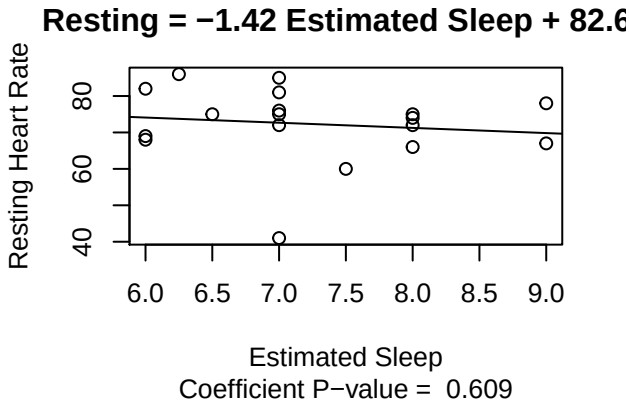
plot_lms

This function produces a series of scatterplots that match up with the columns selected. It then fits a linear regression and posts the equation for the line at the top of each scatterplot. I was also able to now add the p-value for the coefficient for the slope of the line to the plot at the bottom. I would like to add some way of doing multiple linear regression here and maybe have a way to post if the slope of the line is statistically significant. It doesn't seem that any of these linear regressions seem to fit the data very well. Also none of the p-values are significant.

```
par(mar= c(5.0, 4.0, 3.0, 2))
tester %>% plot_lms(., col_names = c("Hrs on Hwk", "Miles walking", "Estimated Sleep"),
         response_variable = "Resting Heart Rate")
```

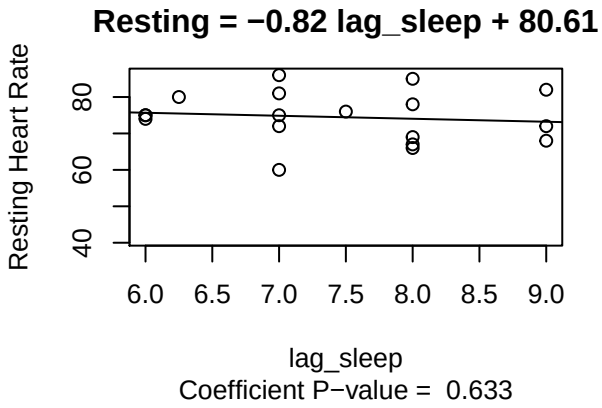


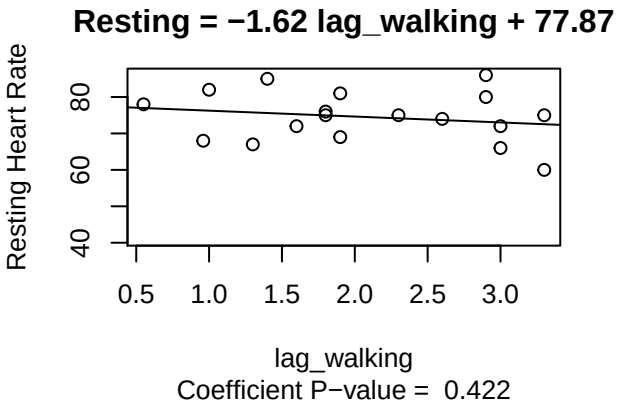


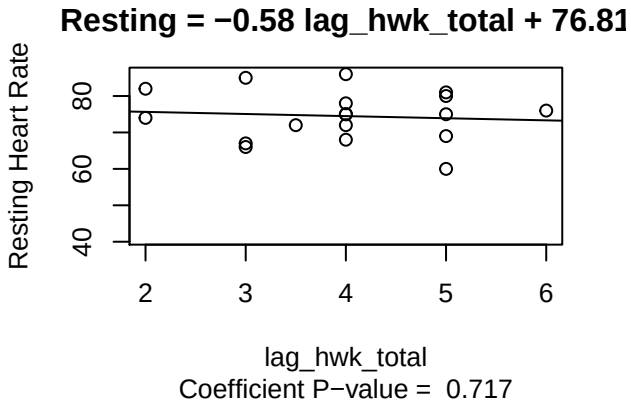


I then tried an compare the resting heart rate to the pervious day's data. Again, there doesn't seem to be any clear fit to the data. Also none of the p-values for the coefficient of the slope are statistically significiant either.

```
par(mar= c(5.0, 4.0, 3.0, 2))
tester <- tester %>% mutate(lag_sleep = lag(tester$"Estimated Sleep", 1),
                            lag_walking= lag(tester$"Miles walking", 1),
                            lag_hwk_total = lag(tester$"Hrs on Hwk", 1))
tester %>% plot_lms(., col_names = c("lag_sleep", "lag_walking", "lag_hwk_total"),
         response_variable = "Resting Heart Rate")
```



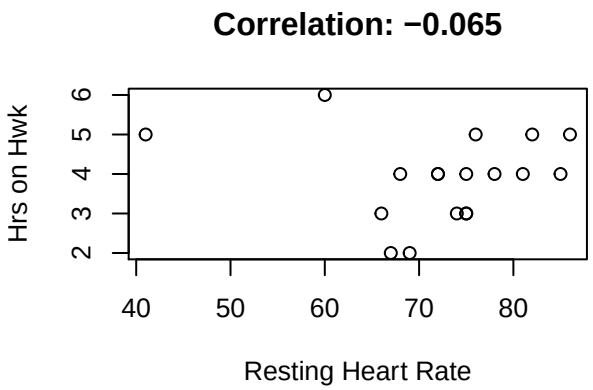


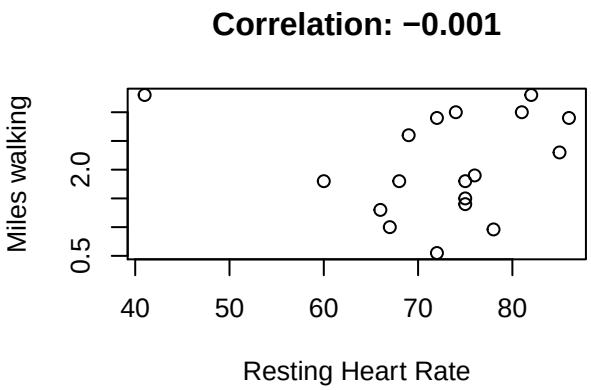


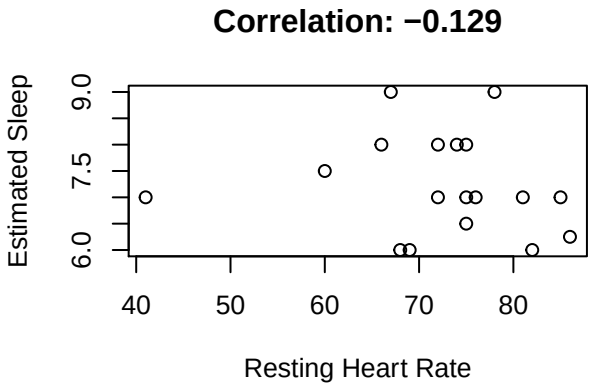
plot_cor

This function produces a series of scatterplots that match up with the columns selected but this time it prints the correlation of the variable of the columns selected with the response variable. As you can see for these three variables there isn't a strong correlation between them and resting heart rate.

```
par(mar = c(4.1, 4.1,4.1,1.1))
tester %>% plot_cor(. ,col_names = c("Hrs on Hwk", "Miles walking", "Estimated Sleep"),
         response_variable = "Resting Heart Rate")
```



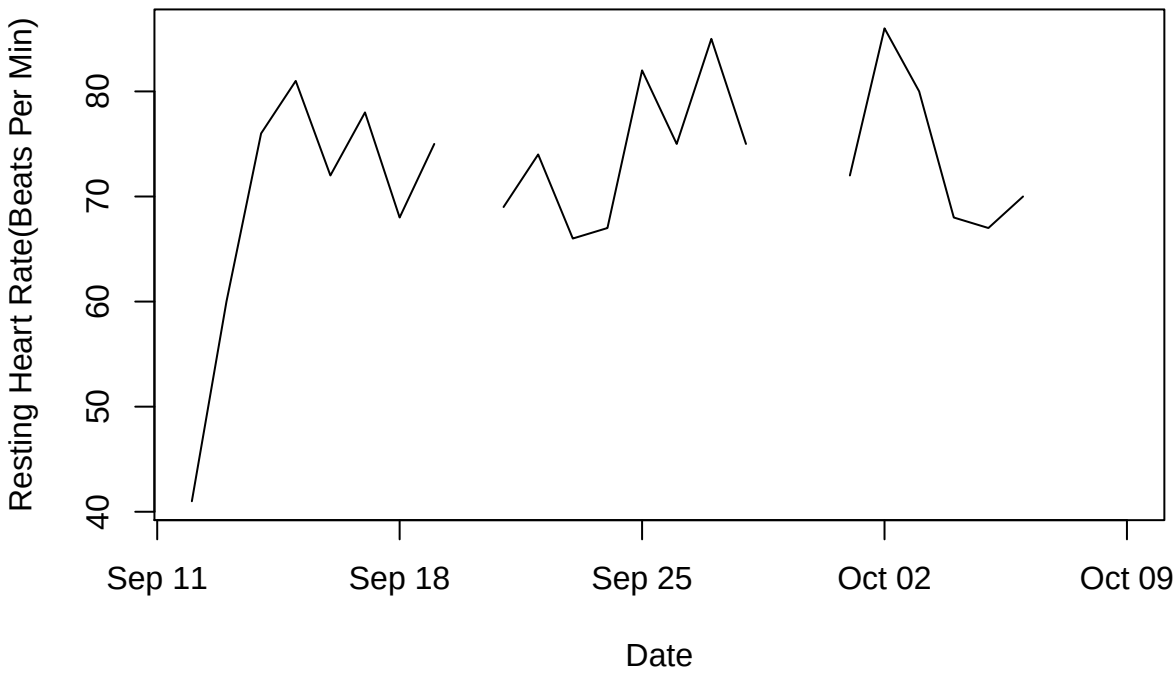




Other Analysis of the Resting Heart Rate Data.

This is just a plot of my resting heart rate. It looks like the plot might be cyclical. So Then i thought to compare across days of the week.

```
plot(tester$Date, tester$"Resting Heart Rate", type = "l",
     ylab = "Resting Heart Rate(Beats Per Min)", xlab = "Date")
```



Interestingly, it seems that my resting heart rate is high on Monday and Friday. I'm not sure why that would be. This would probably something I would continually look at.

```
days_of_week <- as.factor(c("T", "W", "Th", "F", "S", "Su", "M"))
tester$days_of_week <- days_of_week
mean_ave <- by(tester$`Resting Heart Rate`, tester$days_of_week, function(x) mean(x, na.rm = TRUE))
mean_ave_df <- as.data.frame(do.call(rbind, list(mean_ave)))
kable(mean_ave_df)
```

F	M	S	Su	T	Th	W
75	78.75	69	72.33333	67.75	71.75	71

Although, currently if we look at the the Tukey Multiple comparison test with a 95% family wise confidence level. We see that none of the of comparisons are statistically significant.

```
TukeyHSD(aov(tester$`Resting Heart Rate` ~ tester$days_of_week))
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = tester$`Resting Heart Rate` ~ tester$days_of_week)
##
## $`tester$days_of_week`
##              diff       lwr      upr     p adj
## M-F     3.7500000 -22.44476 29.94476 0.9987995
## S-F    -6.0000000 -37.30872 25.30872 0.9940676
```

```
## Su-F   -2.6666667 -30.67004 25.33671 0.9998839
## T-F    -7.2500000 -33.44476 18.94476 0.9622552
## Th-F   -3.2500000 -29.44476 22.94476 0.9994658
## W-F    -4.0000000 -32.00337 24.00337 0.9988144
## S-M    -9.7500000 -39.45206 19.95206 0.9190067
## Su-M   -6.4166667 -32.61142 19.77809 0.9790352
## T-M   -11.0000000 -35.25163 13.25163 0.7297533
## Th-M   -7.0000000 -31.25163 17.25163 0.9541439
## W-M    -7.7500000 -33.94476 18.44476 0.9486792
## Su-S    3.3333333 -27.97539 34.64206 0.9997782
## T-S    -1.2500000 -30.95206 28.45206 0.9999991
## Th-S    2.7500000 -26.95206 32.45206 0.9999014
## W-S     2.0000000 -29.30872 33.30872 0.9999889
## T-Su   -4.5833333 -30.77809 21.61142 0.9963627
## Th-Su  -0.5833333 -26.77809 25.61142 1.0000000
## W-Su   -1.3333333 -29.33671 26.67004 0.9999981
## Th-T    4.0000000 -20.25163 28.25163 0.9973650
## W-T     3.2500000 -22.94476 29.44476 0.9994658
## W-Th   -0.7500000 -26.94476 25.44476 0.9999999
```

Answering Questions of HW 5

1) I continued to work on my R package. I added some functionailty to my plot_lms function. It know also outputs the p-value for the coefficient of the slope of the line.

2) I did try to add tidyverse commands to make my functions more readable. Although, some of my code would turn vectors into time series when I converted them to tibbles. So hopefully, I can fix that in the future. I think my code is more readable now, especially the code in the vignette. I started looking at whether the day of the week seems to make a big difference. In future drafts I hope to add more analysis of this.

3)a) I think that my chunks are pretty easy to understand. I'd like to add some more functions to my add analysis.

b) Yes I think that I would like to make my function more applicable to other data sources. Also I'd like to do some significance testing with the days of the week.

c) I think that my function do work well with other dataset. Although, I do not have any parts in my functions to check to make sure the data is in a good format. Also I would like to add more abilities for dataset with missing data. For the most part, I just remove them at this point. I think it is pretty easy to update my data considering my function "updating_heartRate" does that. I think someone could collect similar data and use my functions. They aren't overally complicated functions. I think the help files are understandable. Although, I would like to add more details to them if this were to go out into the public.