Bellabeat Marketing Analysis Case Study

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About Bellabeat

Urška Sršen and Sando Mur founded Bellabeat, a high-tech company that manufactures health-focused smart products. Sršen used her background as an artist to develop beautifully designed technology that informs and inspires women around the world. Collecting data on activity, sleep, stress, and reproductive health has allowed Bellabeat to empower women with knowledge about their own health and habits. Since it was founded in 2013, Bellabeat has grown rapidly and quickly positioned itself as a tech-driven wellness company for women.

ASK PHASE

Sršen asked to analyze smart device usage data in order to gain insight into how consumers use non-Bellabeat smart devices. She then wants you to select one Bellabeat product to apply these insights to in your presentation.

The following questions guided my analysis:

1. What are some trends in smart device usage?
2. How could these trends apply to Bellabeat customers?
3. How could these trends help influence Bellabeat marketing strategy?

Business Task

Critically analyze and identify potential opportunities for growth at Bellabeat, and recommendations for the Bellabeat marketing team to help strategize, improve sales and patronage based on trends in smart device usage.

PREPARE PHASE

Data Source

- FitBit Fitness Tracker Data (CC0: Public Domain, dataset made available through Mobius): This Kaggle data set contains personal fitness tracker from thirty fitbit users. The datasets were generated by respondents to a distributed survey via Amazon Mechanical Turk between 03.12.2016 - 05.12.2016. Thirty eligible Fitbit users consented to the submission of personal tracker data, including minute-level output for physical activity, heart rate, and sleep monitoring. It includes information about daily activity, steps, and heart rate that can be used to explore users' habits

Setting up my environment and loading of packages

```
install.packages("tidyverse")
```

```
## Installing package into '/home/rstudio-user/R/x86_64-pc-linux-gnu-library/4.0'
## (as 'lib' is unspecified)
```

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.3     v purrr   0.3.4
## v tibble  3.1.2     v dplyr   1.0.6
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

```
library(dplyr)
library(ggplot2)
library(tidyr)
```

```
activity <- read.csv("/cloud/project/google_data_analytics_capstone_case_study/dailyActivity_merged.csv
```

LOADING DAILYACTIVITY DATA FRAME

```
calories <- read.csv("/cloud/project/google_data_analytics_capstone_case_study/hourlyCalories_merged.cs
```

LAODING HOURLYCALORIES DATA FRAME

```
sleep <- read.csv("/cloud/project/google_data_analytics_capstone_case_study/sleepDay_merged.csv")
```

LOADING SLEEPDAILY DATA FRAME

```
weight <- read.csv("/cloud/project/google_data_analytics_capstone_case_study/weightLogInfo_merged.csv")
```

LOADING WEIGHTLOGINFO DATA FRAME

```
intensities <- read.csv("/cloud/project/google_data_analytics_capstone_case_study/hourlyIntensities_merg
```

LOADING HOURLYINTENSITIES DATA FRAME

PROCESS PHASE

head() - This return the First six or Last Parts of an Object in this case activity data frame

```
head(activity)
```

```
##           Id ActivityDate TotalSteps TotalDistance TrackerDistance
## 1 1503960366    4/12/2016      13162          8.50            8.50
## 2 1503960366    4/13/2016      10735          6.97            6.97
## 3 1503960366    4/14/2016      10460          6.74            6.74
## 4 1503960366    4/15/2016       9762          6.28            6.28
## 5 1503960366    4/16/2016      12669          8.16            8.16
## 6 1503960366    4/17/2016       9705          6.48            6.48
##   LoggedActivitiesDistance VeryActiveDistance ModeratelyActiveDistance
## 1                        0              1.88                     0.55
## 2                        0              1.57                     0.69
## 3                        0              2.44                     0.40
## 4                        0              2.14                     1.26
## 5                        0              2.71                     0.41
## 6                        0              3.19                     0.78
##   LightActiveDistance SedentaryActiveDistance VeryActiveMinutes
## 1                6.06                       0                25
## 2                4.71                       0                21
## 3                3.91                       0                30
## 4                2.83                       0                29
## 5                5.04                       0                36
## 6                2.51                       0                38
##   FairlyActiveMinutes LightlyActiveMinutes SedentaryMinutes Calories
## 1                  13                  328              728     1985
## 2                  19                  217              776     1797
## 3                  11                  181             1218     1776
## 4                  34                  209              726     1745
## 5                  10                  221              773     1863
## 6                  20                  164              539     1728
```

glimpse() - This makes it possible to see every column in a data frame

```
glimpse(activity)
```

```
## Rows: 940
## Columns: 15
## $ Id                       <dbl> 1503960366, 1503960366, 1503960366, 150396036~
## $ ActivityDate             <chr> "4/12/2016", "4/13/2016", "4/14/2016", "4/15/~
## $ TotalSteps               <int> 13162, 10735, 10460, 9762, 12669, 9705, 13019~
## $ TotalDistance            <dbl> 8.50, 6.97, 6.74, 6.28, 8.16, 6.48, 8.59, 9.8~
## $ TrackerDistance          <dbl> 8.50, 6.97, 6.74, 6.28, 8.16, 6.48, 8.59, 9.8~
## $ LoggedActivitiesDistance <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ~
## $ VeryActiveDistance       <dbl> 1.88, 1.57, 2.44, 2.14, 2.71, 3.19, 3.25, 3.5~
## $ ModeratelyActiveDistance <dbl> 0.55, 0.69, 0.40, 1.26, 0.41, 0.78, 0.64, 1.3~
## $ LightActiveDistance      <dbl> 6.06, 4.71, 3.91, 2.83, 5.04, 2.51, 4.71, 5.0~
## $ SedentaryActiveDistance  <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ~
## $ VeryActiveMinutes        <int> 25, 21, 30, 29, 36, 38, 42, 50, 28, 19, 66, 4~
## $ FairlyActiveMinutes      <int> 13, 19, 11, 34, 10, 20, 16, 31, 12, 8, 27, 21~
## $ LightlyActiveMinutes     <int> 328, 217, 181, 209, 221, 164, 233, 264, 205, ~
## $ SedentaryMinutes         <int> 728, 776, 1218, 726, 773, 539, 1149, 775, 818~
## $ Calories                 <int> 1985, 1797, 1776, 1745, 1863, 1728, 1921, 203~
```

str() - Compactly Display the Structure of an Arbitrary R Object

```
str(activity)
```

```
## 'data.frame':    940 obs. of  15 variables:
##  $ Id                       : num  1.5e+09 1.5e+09 1.5e+09 1.5e+09 1.5e+09 ...
##  $ ActivityDate             : chr  "4/12/2016" "4/13/2016" "4/14/2016" "4/15/2016" ...
##  $ TotalSteps               : int  13162 10735 10460 9762 12669 9705 13019 15506 10544 9819 ...
##  $ TotalDistance            : num  8.5 6.97 6.74 6.28 8.16 ...
##  $ TrackerDistance          : num  8.5 6.97 6.74 6.28 8.16 ...
##  $ LoggedActivitiesDistance: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ VeryActiveDistance       : num  1.88 1.57 2.44 2.14 2.71 ...
##  $ ModeratelyActiveDistance: num  0.55 0.69 0.4 1.26 0.41 ...
##  $ LightActiveDistance      : num  6.06 4.71 3.91 2.83 5.04 ...
##  $ SedentaryActiveDistance : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ VeryActiveMinutes        : int  25 21 30 29 36 38 42 50 28 19 ...
##  $ FairlyActiveMinutes      : int  13 19 11 34 10 20 16 31 12 8 ...
##  $ LightlyActiveMinutes     : int  328 217 181 209 221 164 233 264 205 211 ...
##  $ SedentaryMinutes         : int  728 776 1218 726 773 539 1149 775 818 838 ...
##  $ Calories                 : int  1985 1797 1776 1745 1863 1728 1921 2035 1786 1775 ...
```

Checking for errors and formatiing.

```
activity$ActivityDate=as.POSIXct(activity$ActivityDate, format="%m/%d/%Y", tz=Sys.timezone())
activity$date <- format(activity$ActivityDate, format = "%m/%d/%y")

calories$ActivityHour=as.POSIXct(calories$ActivityHour, format="%m/%d/%Y %I:%M:%S %p", tz=Sys.timezone()
calories$time <- format(calories$ActivityHour, format = "%H:%M:%S")
calories$date <- format(calories$ActivityHour, format = "%m/%d/%y")

intensities$ActivityHour=as.POSIXct(intensities$ActivityHour, format="%m/%d/%Y %I:%M:%S %p", tz=Sys.time
intensities$time <- format(intensities$ActivityHour, format = "%H:%M:%S")
intensities$date <- format(intensities$ActivityHour, format = "%m/%d/%y")

sleep$SleepDay=as.POSIXct(sleep$SleepDay, format="%m/%d/%Y %I:%M:%S %p", tz=Sys.timezone())
sleep$date <- format(sleep$SleepDay, format = "%m/%d/%y")
```

I noticed some limitations with the timestamp data. which I have to covert to date and time format before analysis and plit date and time separately.

EXPLORING DISTINCT PARTICIPANTS ON EACH DATA SET

NOTE: There are 33 participants in the activity, calories and intensities data sets, 24 in the sleep and only 8 in the weight data set. 8 participants is not significant to make any recommendations and conclusions based on this data.

```
n_distinct(activity$Id)
```

```
## [1] 33
```

```
n_distinct(calories$Id)
```

```
## [1] 33
```

```
n_distinct(intensities$Id)
```

```
## [1] 33
```

```
n_distinct(sleep$Id)
```

```
## [1] 24
```

```
n_distinct(weight$Id)
```

```
## [1] 8
```

ANALYZE PHASE

Checking for statistical summary of each variable in data frames

```
# activity
activity %>%
  select(TotalSteps,
         TotalDistance,
         SedentaryMinutes, Calories) %>%
  summary()
```

```
##    TotalSteps    TotalDistance    SedentaryMinutes    Calories
##  Min.   :    0   Min.   : 0.000   Min.   :   0.0   Min.   :   0
##  1st Qu.: 3790   1st Qu.: 2.620   1st Qu.: 729.8   1st Qu.:1828
##  Median : 7406   Median : 5.245   Median :1057.5   Median :2134
##  Mean   : 7638   Mean   : 5.490   Mean   : 991.2   Mean   :2304
##  3rd Qu.:10727   3rd Qu.: 7.713   3rd Qu.:1229.5   3rd Qu.:2793
##  Max.   :36019   Max.   :28.030   Max.   :1440.0   Max.   :4900
```

```
# explore num of active minutes per category
activity %>%
  select(VeryActiveMinutes, FairlyActiveMinutes, LightlyActiveMinutes) %>%
  summary()
```

```
##  VeryActiveMinutes FairlyActiveMinutes LightlyActiveMinutes
##  Min.   :  0.00    Min.   :  0.00      Min.   :  0.0
##  1st Qu.:  0.00    1st Qu.:  0.00      1st Qu.:127.0
##  Median :  4.00    Median :  6.00      Median :199.0
##  Mean   : 21.16    Mean   : 13.56      Mean   :192.8
##  3rd Qu.: 32.00    3rd Qu.: 19.00      3rd Qu.:264.0
##  Max.   :210.00    Max.   :143.00      Max.   :518.0
```

```
# calories
calories %>%
  select(Calories) %>%
  summary()
```

```
##     Calories
##  Min.   : 42.00
##  1st Qu.: 63.00
##  Median : 83.00
##  Mean   : 97.39
##  3rd Qu.:108.00
##  Max.   :948.00
```

```
# sleep
sleep %>%
  select(TotalSleepRecords, TotalMinutesAsleep, TotalTimeInBed) %>%
```

```
  summary()
```

```
##  TotalSleepRecords TotalMinutesAsleep TotalTimeInBed
##  Min.   :1.000     Min.   : 58.0      Min.   : 61.0
##  1st Qu.:1.000     1st Qu.:361.0      1st Qu.:403.0
##  Median :1.000     Median :433.0      Median :463.0
##  Mean   :1.119     Mean   :419.5      Mean   :458.6
##  3rd Qu.:1.000     3rd Qu.:490.0      3rd Qu.:526.0
##  Max.   :3.000     Max.   :796.0      Max.   :961.0
```

```
# weight
weight %>%
  select(WeightKg, BMI) %>%
  summary()
```

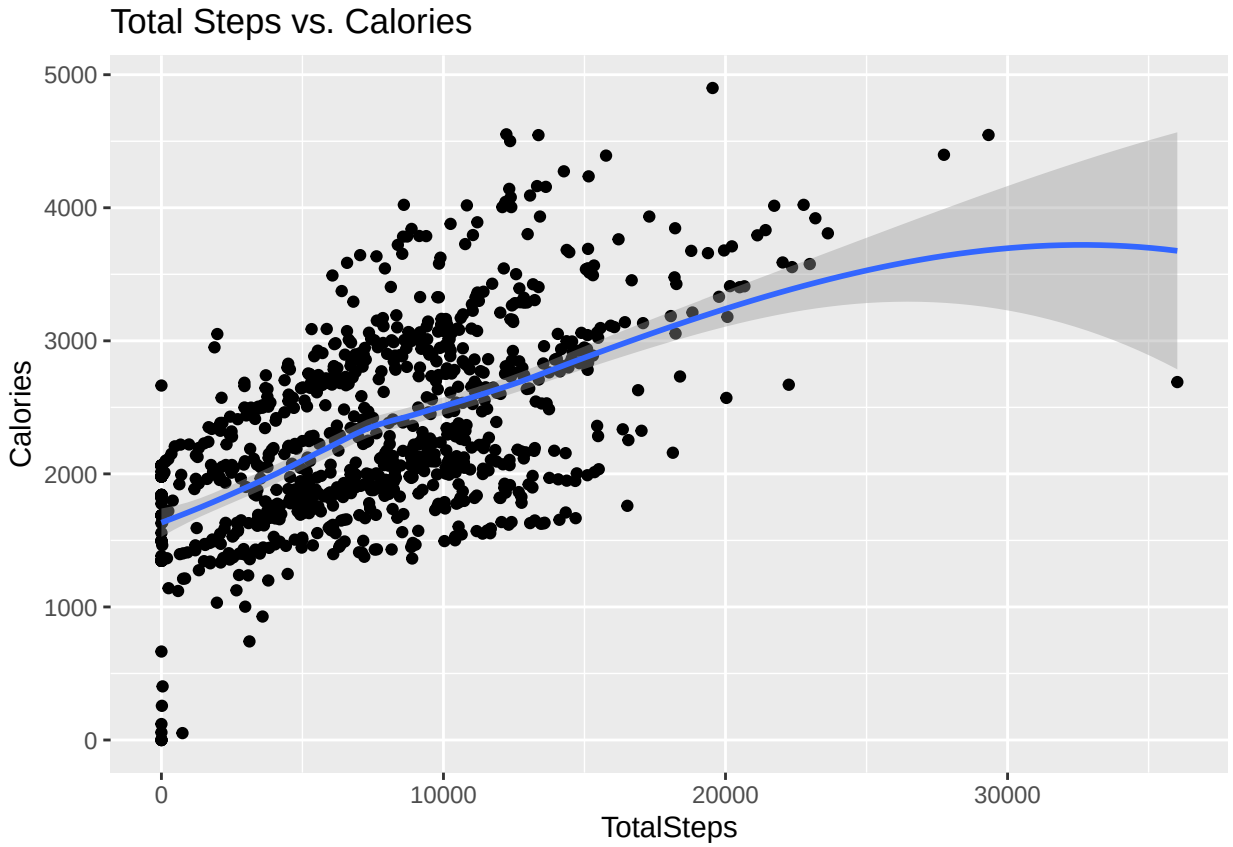
```
##     WeightKg           BMI
##  Min.   : 52.60   Min.   :21.45
##  1st Qu.: 61.40   1st Qu.:23.96
##  Median : 62.50   Median :24.39
##  Mean   : 72.04   Mean   :25.19
##  3rd Qu.: 85.05   3rd Qu.:25.56
##  Max.   :133.50   Max.   :47.54
```

SHARE PHASE

Plotting variables against each others to see relationship

```
# Activity viz
ggplot(data=activity, aes(x=TotalSteps, y=Calories)) +
  geom_point() +
  geom_smooth() +
  labs(title="Total Steps vs. Calories")
```

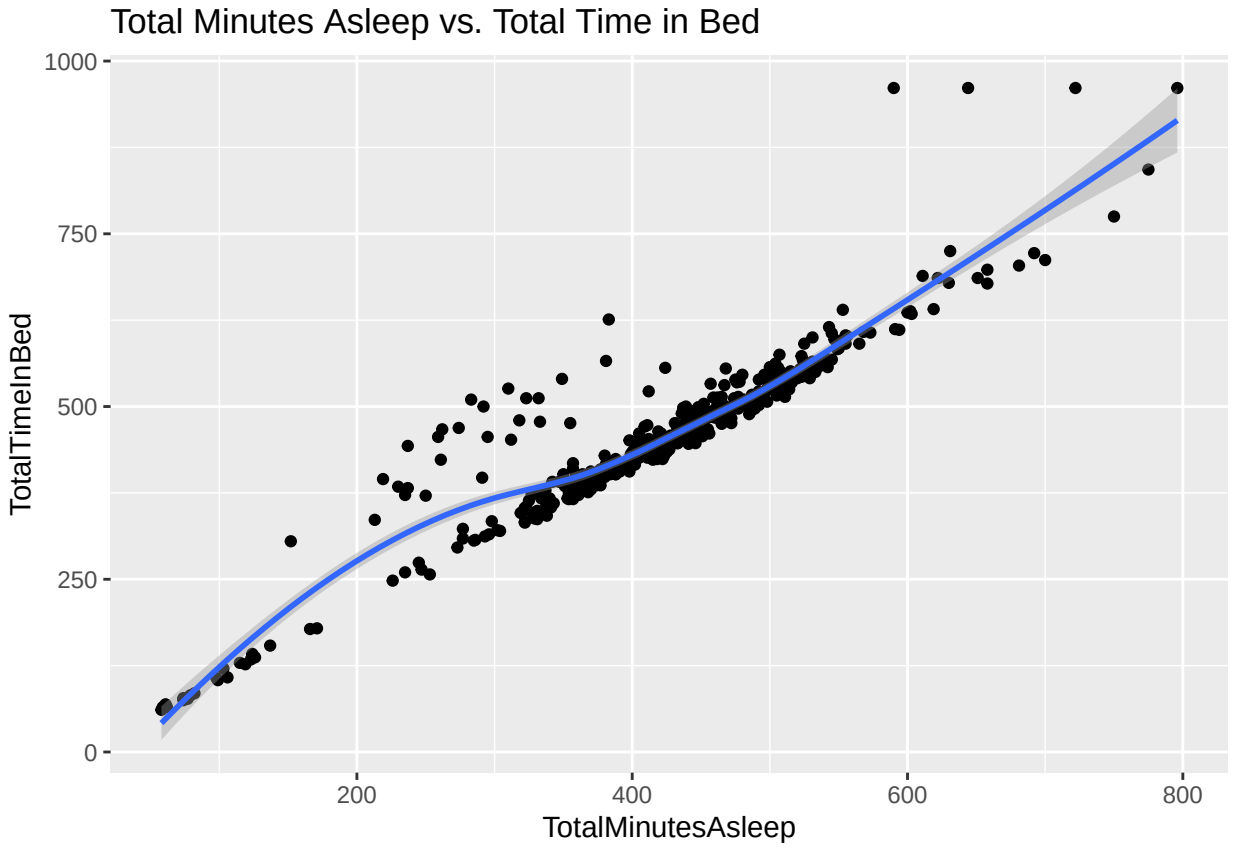
```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



- There is a positive correlation between "Total Steps and Calories', which can be observed easily from the plot - the more activities they have, the more calories they burn.

```
# Sleep viz
ggplot(data=sleep, aes(x=TotalMinutesAsleep, y=TotalTimeInBed)) +
  geom_point()+
  geom_smooth()+
  labs(title="Total Minutes Asleep vs. Total Time in Bed")
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



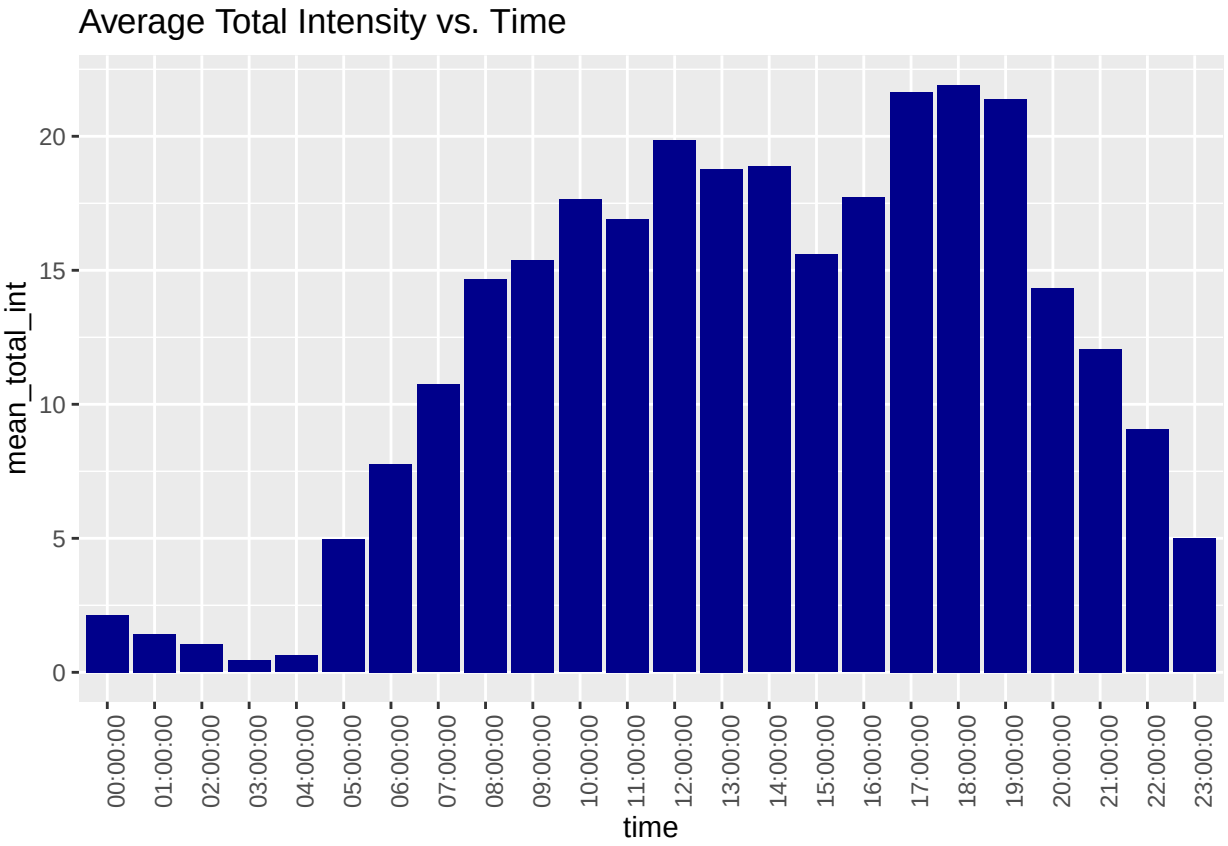
- The Total Minutes Asleep and Total Time in Bed are linearly related. So if the Bellabeat app users want to improve their sleep, notifications should be included in the app to notify bed time.

Plotting histogram on intensities data over time (hourly)

```
int_new <- intensities %>%
  group_by(time) %>%
  drop_na() %>%
  summarise(mean_total_int = mean(TotalIntensity))
```

```
ggplot(data=int_new, aes(x=time, y=mean_total_int)) + geom_histogram(stat = "identity", fill='darkblue'
  theme(axis.text.x = element_text(angle = 90)) +
  labs(title="Average Total Intensity vs. Time")
```

```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```



- From the Total Intensity hourly histogram plot, the visual depicts that people are more energetic between 5 am and 10pm.
- Most activities happen between 5 pm and 7 pm - I guess people go for a walk or some gymnastics work out post daily work. This time range can be used in the Bellabeat app to notify and encourage users to go for some exercises.

ACT PHASE

Recommendations and Summary

As stated on https://bellabeat.com/about/ - "Data is the most powerful asset humans have in this century. More powerful than land, machines, and factories. Although it is believed we know everything about ourselves, the truth is different, we barely know the details".

Since the existence of Bellabeat in 2013, they have evolved rapidly and gained reputation in tech-driven wellness company for women.

I therefore used their available data, though which some limitations(i.e few participants) to analyze and gain some insights during the analysis. I found some useful insights which may help strategize and improve productivity of Bellabeat marketing team.

Audience to Target.

ladies who do full-time jobs, or even work from home during this pandemic time (according to the hourly intensity data) and spend a lot of time at the computer, in a meeting, focused on work they are doing (according to the sedentary time data). Even the full house wife can adapt the use of bellabeat App.

These genders do different kinds of light activities to stay healthy - according to the activity type analysis I did. Through the analysis I found out that they need to improve their daily activities to have a good health

system. They might need some knowledge and motivation about developing healthy habits.

Takeaway for the Bellabeat Marketing Team

The Bellabeat app and other products are not just another fitness activity app. It's a like a manual and daily to do app that may empower ladies to balance full personal and professional life and healthy habits and routines by educating and motivating them through daily activities and exercises recommendations.

Recommendation to improve patronage of the Bellabeat app and products

1. From the statistical analysis it was derived that the average total steps per day are 7638 which is a little bit less for having health benefits for according to the CDC research, "https://www.cdc.gov/physicalactivity/basics/adults/index.htm " They found that taking 8,000 steps per day was associated with a 51% lower risk for all-cause mortality (or death from all causes). Taking 12,000 steps per day was associated with a 65% lower risk compared with taking 4,000 steps. Bellabeat can encourage people to take at least 8 000 explaining the benefits for their health.
2. Bellabeat can suggest some low-calorie for their users who may want to lose weight, probably a good idea to control daily calorie consumption.
3. Bellabeat should consider using app notifications to go to bed for their users, if they want to improve their sleep.

THANK YOU!