# Analysis of Health from Health Tracker Data

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# Questions that you found interesting and what motivated you to answer them

- How do Apple watches vs. Fitbits compare when taking heart rate data?
- How does the activity level correlate to average heart rate?
- How does the amount of sleep affect Body Mass Index (BMI)
- How does the activity level affect number of calories burned?

# Datasets Used

- Apple Watch and Fitbit data:

  https://www.kaggle.com/datasets/aleespinosa/apple-watch-and-fitbit-data
- FitBit Fitness Tracker Data: https://www.kaggle.com/datasets/arashnic/fitbit

# Data Cleanup - Fitbit - Apple Watch Data

The data consisted of 49 participants and grouped by age, gender code, height, and weight. There were no unique identifier so a Identifier was created using VBA along with the recording of the gender codes  with  0 and 1, recoded to female and male

Updated a column name to read **heart** instead of **hear**

Removed duplicates

# Terminology

**METs - Metabolic Equivalents, a simple way to measure energy cost of physical activities. Example, using 1 MET when sitting.**

**Resting Heart Rate - your heart rate when your body is at rest**

**Normal Heart Rate - number of times your heart beats per minute**

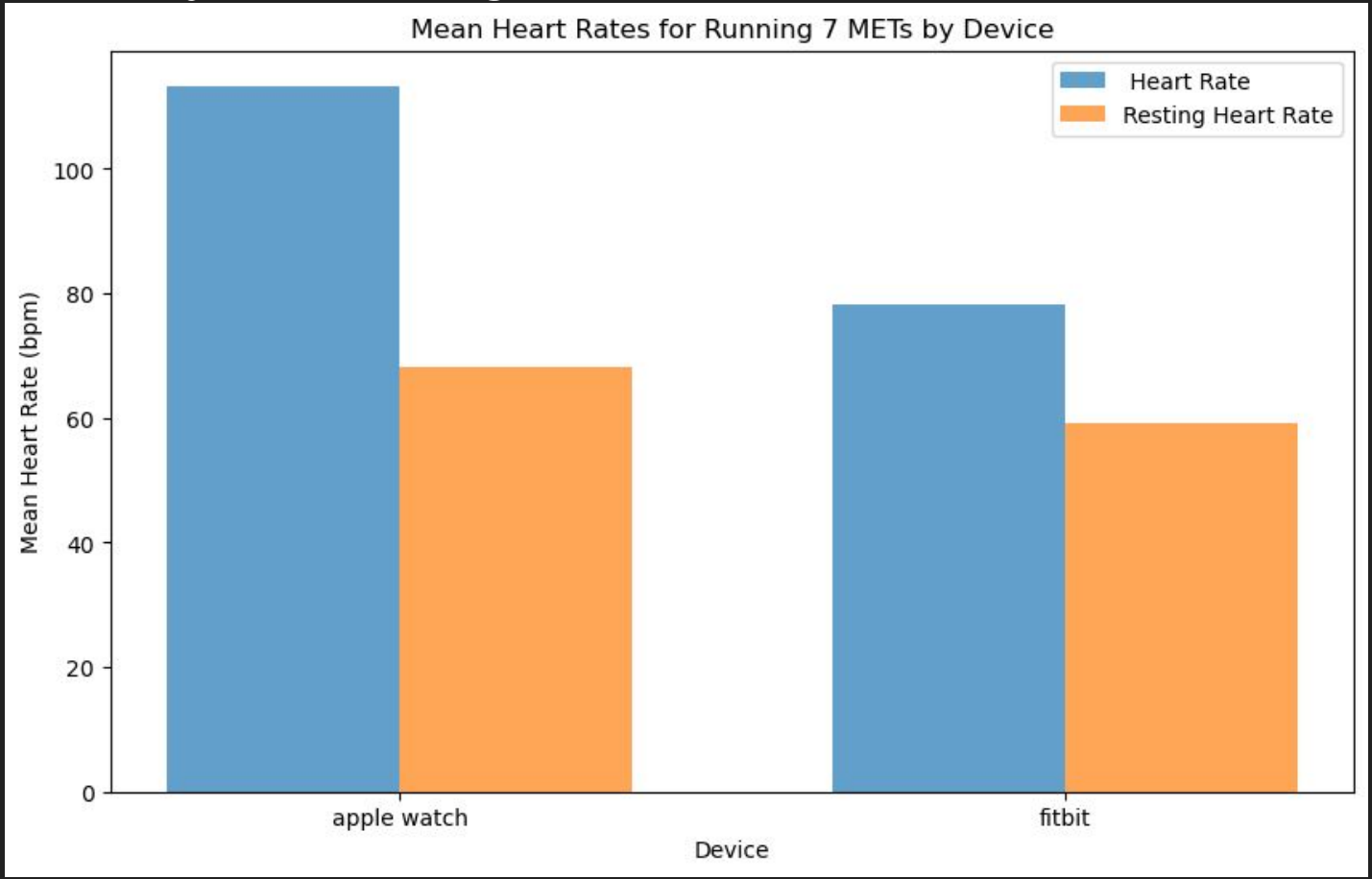
# How do Apple watches vs. Fitbits compare when taking heart rate data?

The activities measured were Running at 3 METs, 5 METs and 7 METs, self paced walking, sitting and lying down.

This report looks at the Running at the various METs and self paced walking.

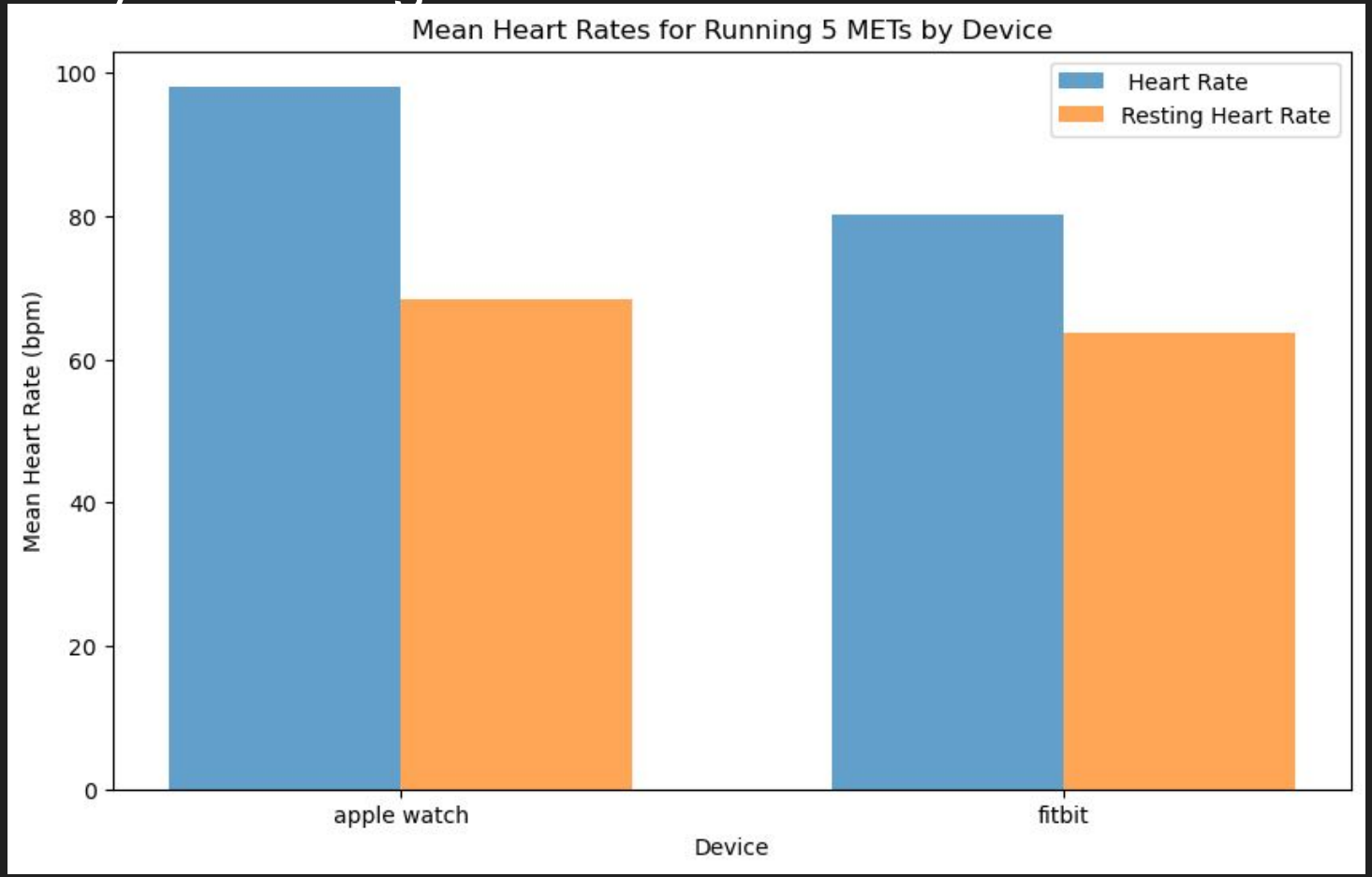
MET is the number that indicates the relative rate at which calories are burned during an activity.

# Activity - Running 7 METS

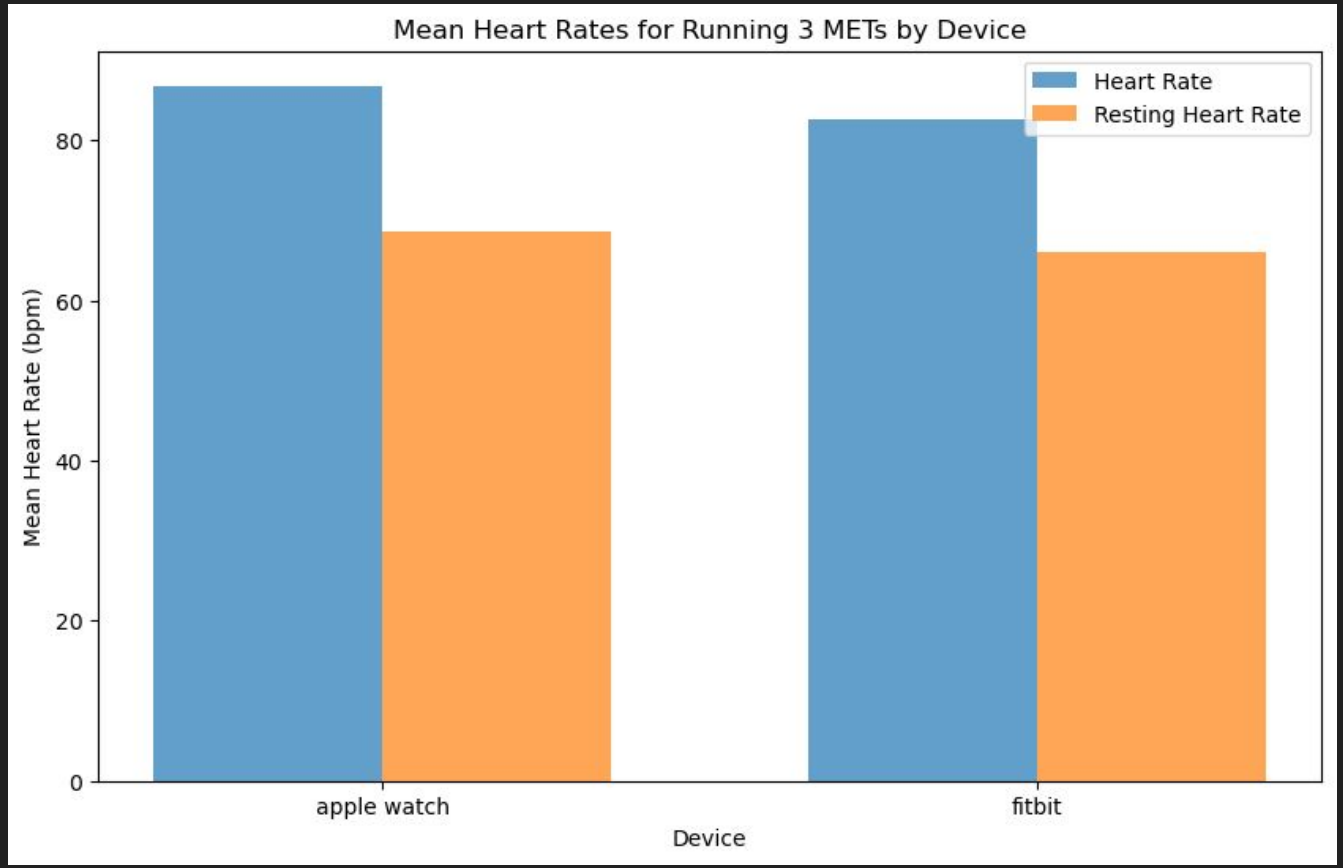



The following slides show the mean heart rates per activity.

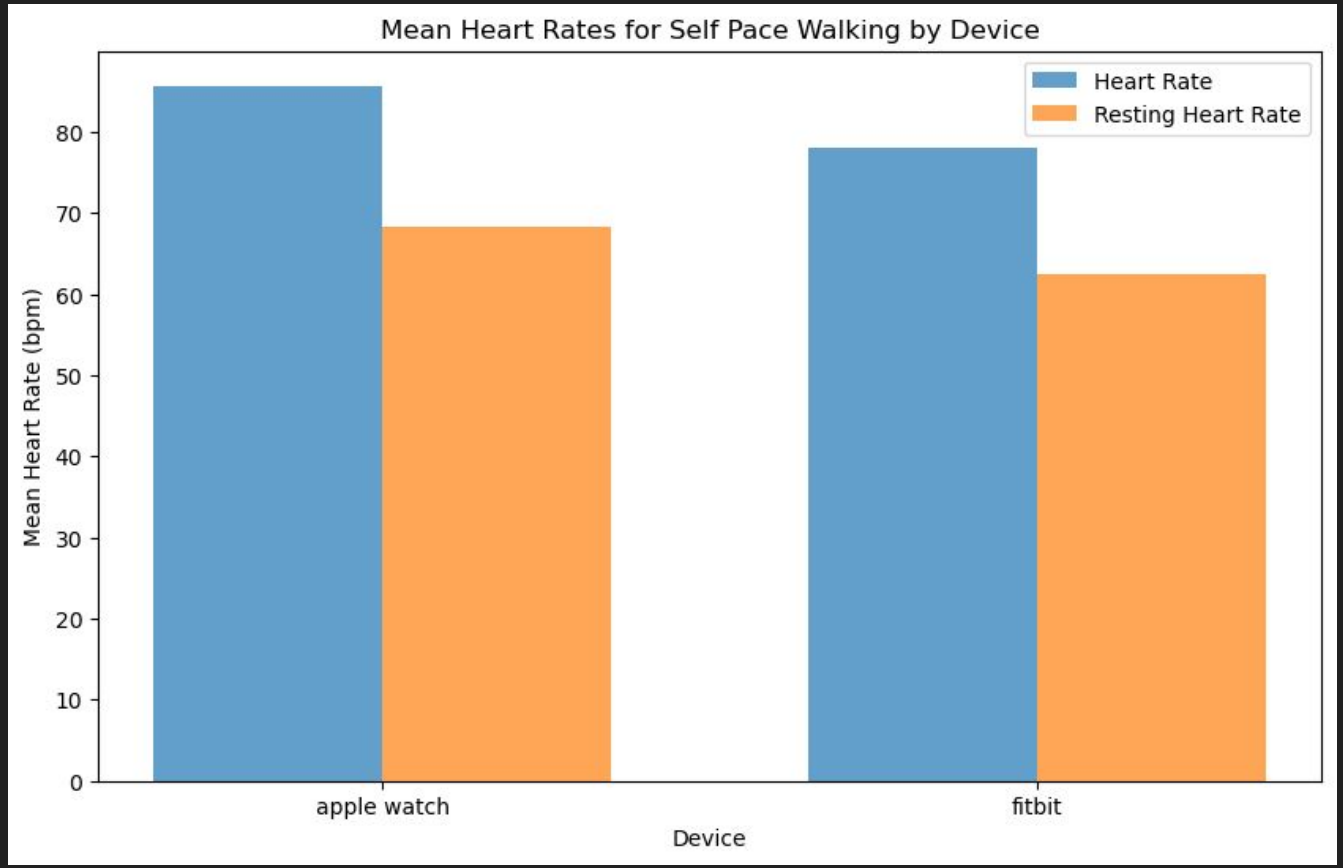
# Activity - Running 5 METS

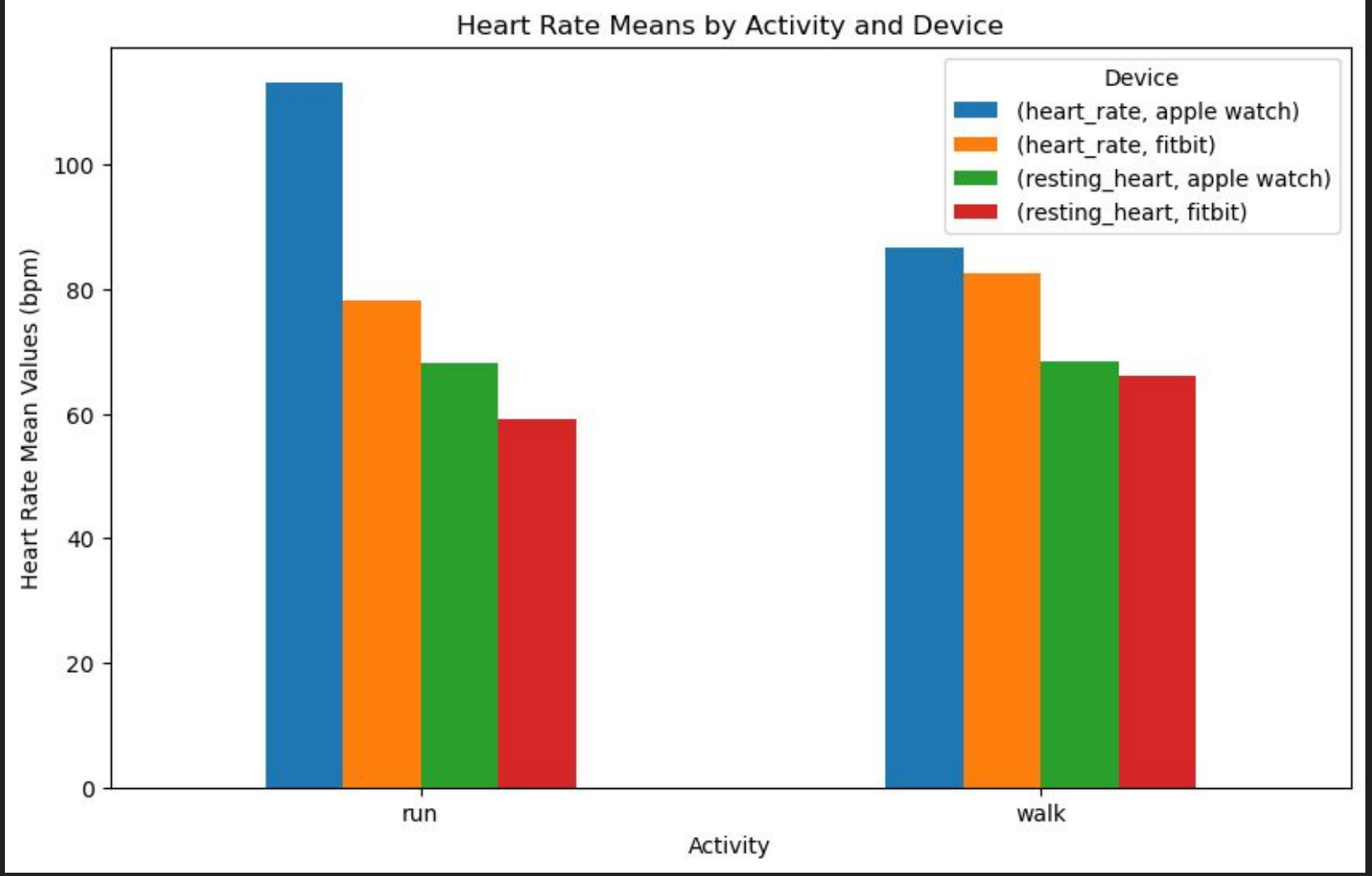


# Activity - Running 3 METS



# Activity - Self Pace Walking




Heart Rate Means by Activity and Device
Device
(heart_rate, apple watch)
(heart_rate, fitbit)
(resting_heart, apple watch)
(resting_heart, fitbit)
Heart Rate Mean Values (bpm)
0
20
40
60
80
100
run
walk
Activity

# Further Analysis

T-Test-Independent were executed for the resting heart rate of each activities. The p-values are listed below:

| ACTIVITY | P-VALUE |
|---|---|
| Running 3 METs | 0.09087616379978523 |
| Running 5 METs | 0.0008572713151761626 |
| Running 7 METs | 3.473589188909155e-08 |
| Self-Pace walking | 0.00013644418747026964 |

# Apple Watch-Fitbit Conclusion

There were no significant differences in the recording of the resting heart rate after the various activities between the two devices.

# Data Cleanup - Fitbit Data

- Data from Fitbit set was in the form of 18 different .csv files
- Necessary .csv files were determined and merged into dataframes for the questions at hand
  - Heartrate_seconds_merged.csv
  - dailyIntensities_merged.csv
  - sleepDay_merged.csv
  - weightLogInfo_merged.csv
  - dailyActivity_merged.csv
- Null values were dropped using dropna()
- The majority of the data cleaning was combining .csv files into dataframes and removing extraneous columns to leave dataframes that only had the values we needed to answer our questions

# Terminology for Fitbit Only Dataset

**Body Mass Index (BMI) - a person's weight in kilograms (or pounds) divided by the square of height in meters (or feet). A healthy BMI range is 18.5 to 24.9**

**Average Heart Rate: the mean of the heart rate for an individual over the course of data collection, regardless of activity level**

**Very Active Minutes: Activity that is greater than 6 METs**

**Fairly Active Minutes: Activity that is 3 and 6 METs**

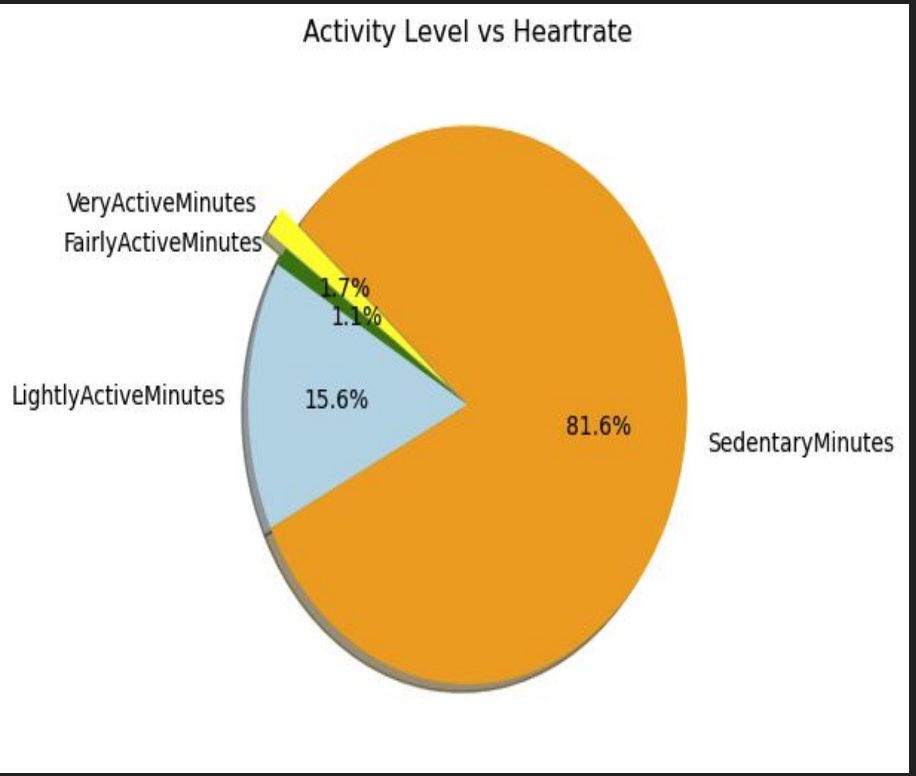
**Lightly Active Minutes: Activity that is between 1.5 and 3 METs**

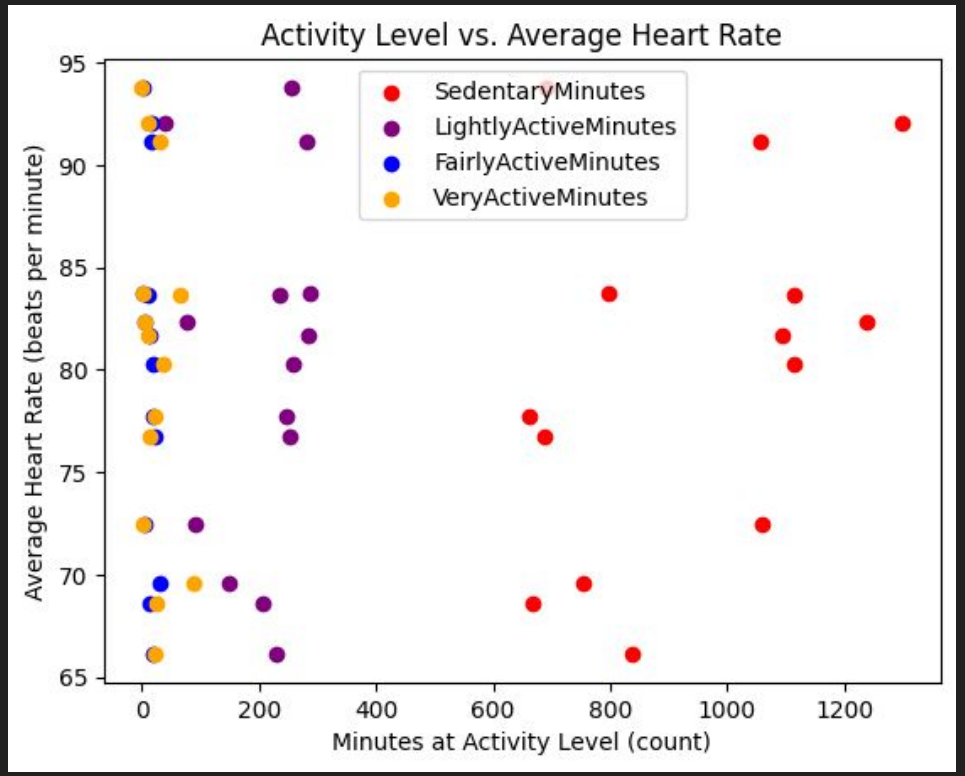
**Sedentary Minutes: Activity that is below 1.5 METS or inactivity**

**https://www.cdc.gov/healthyweight/assessing/bmi/index.html**

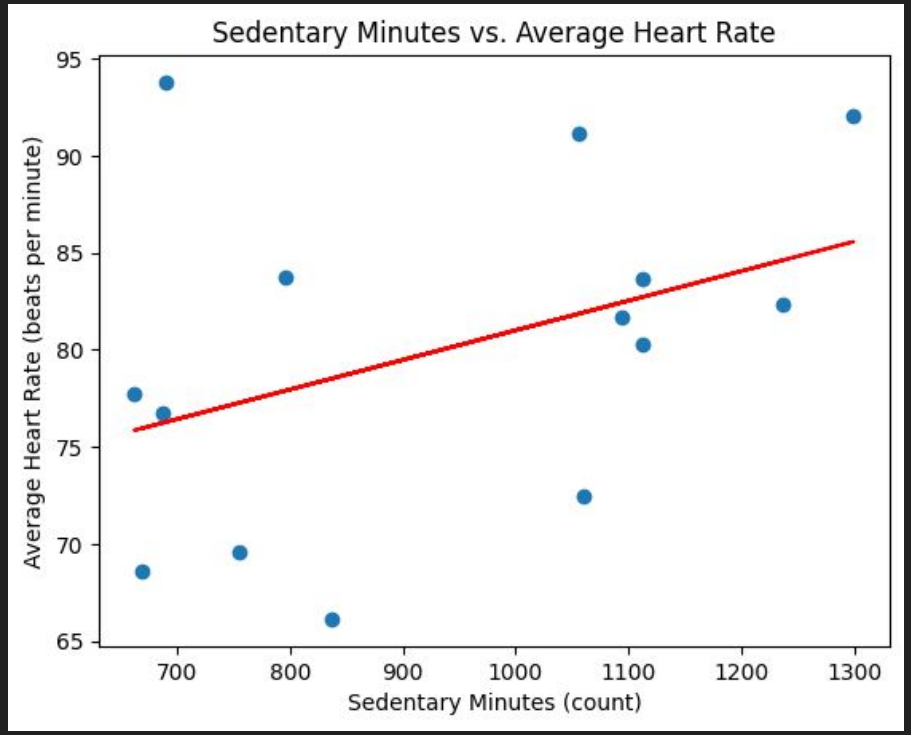
**https://acrjournals.onlinelibrary.wiley.com/doi/10.1002/acr2.11099**

# How does the activity level correlate to average heart rate?



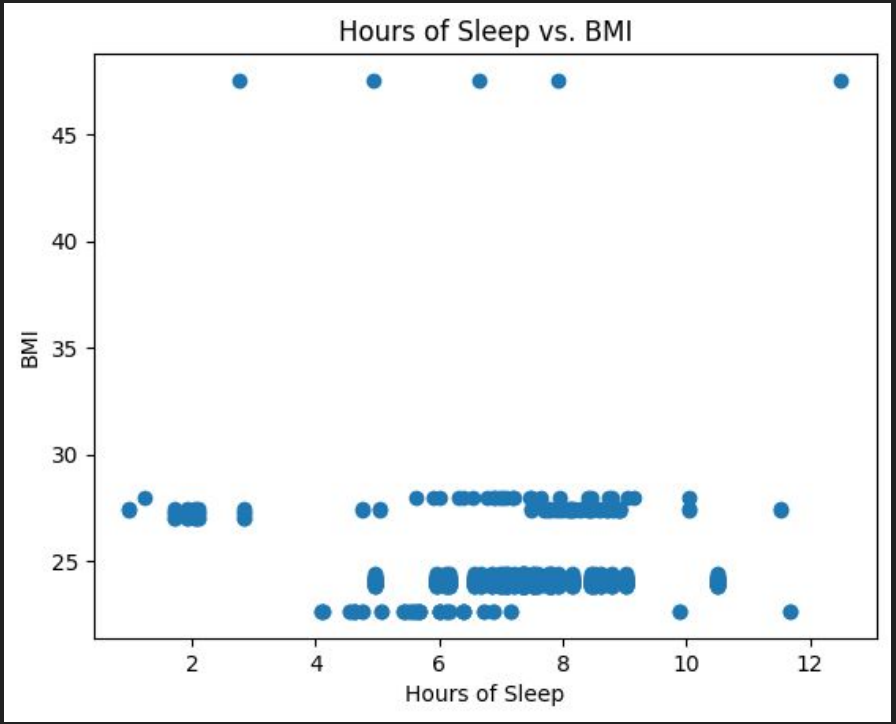



# How does the activity level correlate to average heart rate? (cont.)



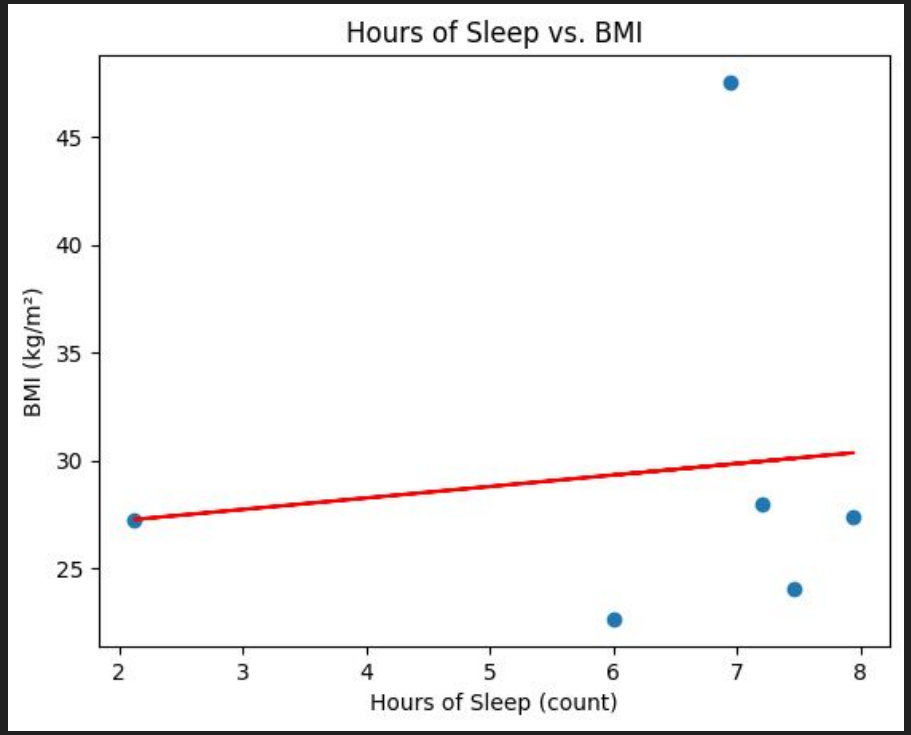

- Weak positive correlation between sedentary minutes and average heart rate (Pearson's r value ~0.4)
- R-squared ~ 0.157 (very weak)
- The more minutes an individual spends sedentary, the higher their average heart rate is
- It is important to note that this is a small pool of participants

# How does the amount of sleep affect Body Mass Index (BMI)?



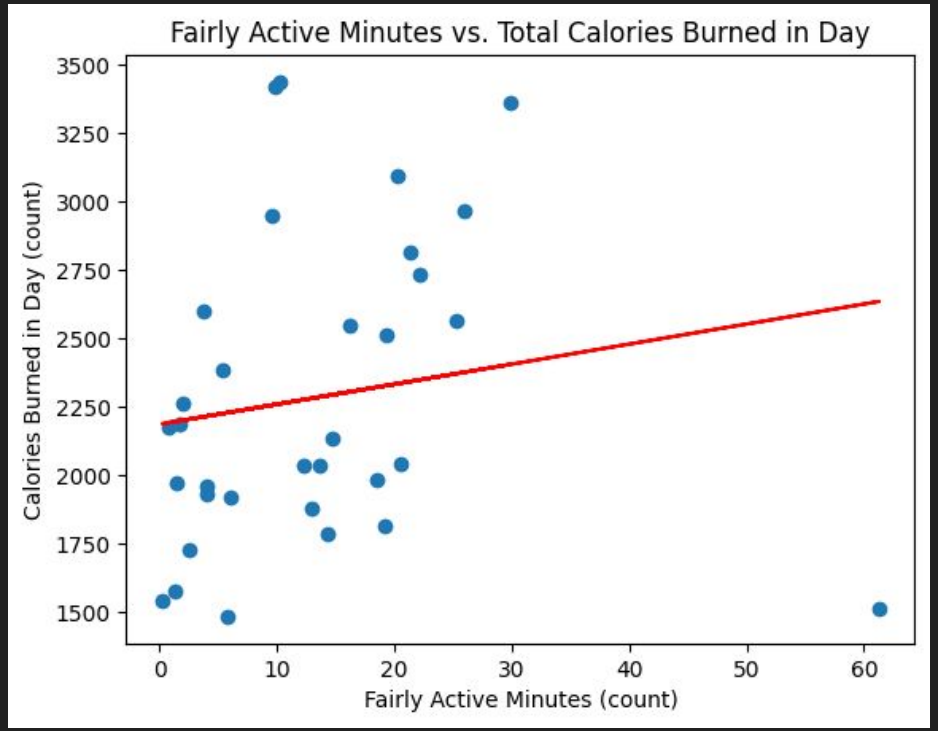

- Plot shows each entry for sleep and corresponding BMI
- There are no obvious trends here
- Need to consolidate dataset to look for trends

# How does the amount of sleep affect Body Mass Index (BMI)? (cont.)



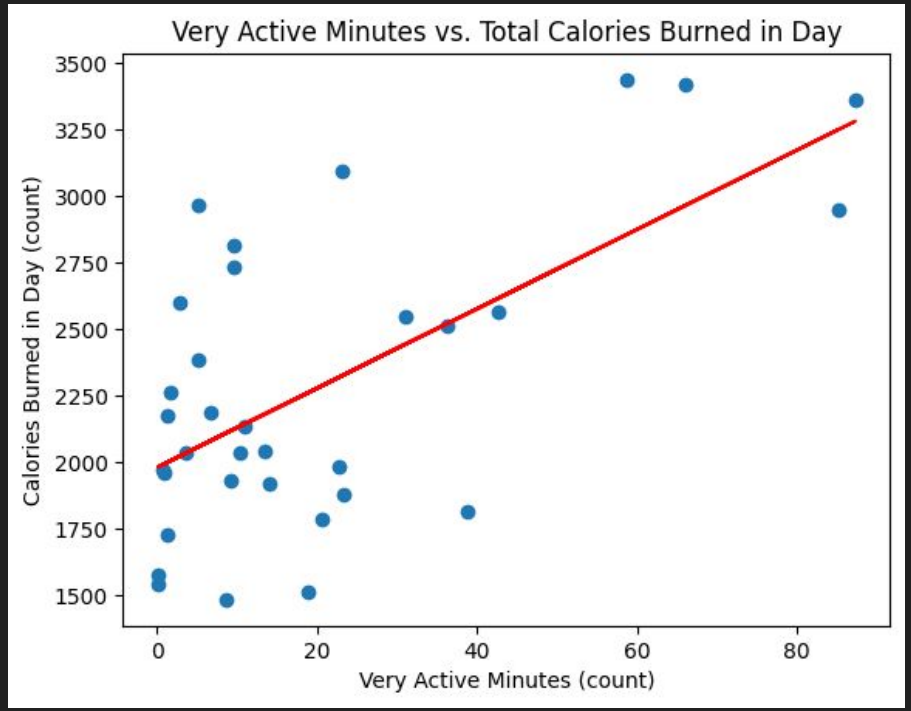

- Simplify data down to average BMI vs. average amount of sleep per participant
- Weak correlation between sleep and BMI (Pearson's r value ~0.125)
- R-squared ~ 0.016 (very weak)
- Note: this is a very small dataset, so a larger dataset would be necessary to draw more definite conclusions

# How does the activity level affect number of calories burned?




- Weak correlation between fairly active minutes and total calories burned in a day (Pearson's r value ~0.16)
- R-squared ~ 0.024 (very weak)
- From this, we can conclude that people who engage in more fairly active minutes may tend to burn more calories than people who don't

# How does the activity level affect number of calories burned? (cont.)




- There is a strong correlation between very active minutes and total calories burned in a day (Pearson's r value ~0.63)
- R-squared ~ 0.397 (weak)
- We can conclude from this that people who engage in intense exercise are more likely to burn more calories in a day than people who engage in less intense/no exercise.

# Final Conclusions

- There is no significant difference in the recording of resting heart rate between apple watch and fitbit fitness trackers
- There is a moderate correlation between average heart rate and amount of time spent being sedentary; namely, the more time a person spends sedentary, the more likely they are to have a higher average heart rate
- There is a weak correlation between amount of sleep and BMI; from our data, the conclusion was that a person who gets a larger amount of sleep may have a higher BMI
- There is a strong correlation between very active minutes and total calories burned in a day; people who get more very active minutes tend to burn more calories in a day, overall. The correlation with fairly active minutes is weaker, but it shows that people who exercise tend to burn more calories in a day than people who do not.