**Scenario**

You are a junior data analyst working on the marketing analyst team at Bellabeat, a high-tech manufacturer of health-focused products for women. Bellabeat is a successful small company, but they have the potential to become a larger player in the global smart device market. Urška Sršen, co-founder and Chief Creative Officer of Bellabeat, believes that analyzing smart device fitness data could help unlock new growth opportunities for the company. You have been asked to focus on one of Bellabeat's products and analyze smart device data to gain insight into how consumers are using their smart devices. The insights you discover will then help guide marketing strategy for the company. You will present your analysis to the Bellabeat executive team along with your high-level recommendations for Bellabeat's marketing strategy.

**Time (Product)**

This wellness watch combines the timeless look of a classic timepiece with smart technology to track user activity, sleep, and stress. The Time watch connects to the Bellabeat app to provide you with insights into your daily wellness.

**Bellabeat app**

The Bellabeat app provides users with health data related to their activity, sleep, stress, menstrual cycle, and mindfulness habits. This data can help users better understand their current habits and make healthy decisions. The Bellabeat app connects to their line of smart wellness products.

**Ask**

Analyze competitor smart device data by learning how consumers use non-Bellabeat smart devices to identify growth opportunities and provide recommendations to influence Bellabeat marketing strategy.

**Prepare**

The data for this analysis was retrieved from FitBit Fitness Tracker Data on Kaggle. This dataset was 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. Individual reports can be parsed by export session ID (column A) or timestamp (column B). Variation between output represents use of different types of Fitbit trackers and individual tracking behaviors / preferences.

The data set includes 18 csv files that capture everything from daily activity, calories (daily, hourly and by minute), intensities (daily, hourly and by minute), number of steps (daily, hourly and by minute), heart rate, minute METs, sleep (Day and minute) and weight log info. For the scope of this data analysis only a selection of the 18 data sets that were deemed relevant in addressing the business task. The following datasets were used: daily activity, daily calories, daily intensities, daily steps, heart rate by seconds, daily sleep, and weight log information.

Limitations that exist in this data set include sample size (30 participants), data recording inconsistency (missing data), study duration (2 months), study age (5 years old), and no demographic information such as gender, age, and health conditions.

**Process**

For this analysis, Microsoft Excel and Microsoft SQL Server Management Studio (SSMS) were used. The csv files were opened in Excel and to ensure data frames were imported correctly, Data Integrity User Id was analyzed across all datasets to validate all user Ids are a consistent length. SSMS was used to analyze the number of unique Ids in each table. The following queries were ran to check the number of unique Ids in each table:

```
SELECT DISTINCT Id FROM [bellabeat].[dbo].[dailyActivity_merged$]
SELECT DISTINCT Id FROM [bellabeat].[dbo].[dailyCalories_merged$]
SELECT DISTINCT Id FROM [bellabeat].[dbo].[dailyIntensities_merged$]
SELECT DISTINCT Id FROM [bellabeat].[dbo].[dailySteps_merged$]
SELECT DISTINCT Id FROM [bellabeat].[dbo].[sleepDay_merged$]
SELECT DISTINCT Id FROM [bellabeat].[dbo].[.weightLogInfo_merged$]
```

Query Results:

dailyActivity_merged - 33 unique user IDs

dailyCalories_merged - 33 unique user IDs

dailyIntensities_merged - 33 unique user IDs

dailySteps_merged - 33 unique user IDs
sleepDay_merged - 24 unique user IDs
weightLogInfo_merged - 8 unique user IDs

The query result shows the dataset inconsistencies, because we expect that each of the six datasets would produce 30 unique Ids for each dataset. The inconsistencies found through these queries affect this analysis' results, leading us to assume that this is due to participants' data reporting errors and not using certain features. Running these queries gave us insight into what features participants prioritized and what they are most likely to use their smart device for.

Consolidating datasets:

All six of the datasets contain the "Id" column, so as long as the user Id in daily_activity matches the other specified dataset's user Id, they can be merged. The dailyActivity_merged dataset contains data for calories, intensities, and steps. In excel, using the COUNT() function, analysis shows that the number of Id values within daily_calories, daily_intensities, and daily_steps align with the number of Id values found in the daily_activity dataset, all of which produce 940 data points. Because the number of observations for each Id number are the same in both datasets, the following datasets: daily_calories, daily_intensities, and daily_steps, can all be consolidated into the daily_activity dataset to simplify the analysis process.

## **Analyze**

Daily_activity:

This summary shows the average user is taking 7,638 steps a day, which is approximately 2,400 steps short of the recommended 10,000 steps by the American College of Sports Medicine (ACSM). ACSM recommends 10,000 as it is linked to reducing risk for cardiovascular disease (CVD), type 2 diabetes, and obesity, in addition to the several major muscle groups worked while walking. ACSM recommends that if your baseline is under the 10,000 daily steps to increase your steps by 1,000 per day until the 10,000 daily steps is reached. Recommendations to get more steps include parking further away from your destination, and taking the stairs instead of an escalator or elevator.

Analyzing the active minutes data, it's reported that on average, users are getting 21.16 minutes of "very active" activity a day and 148.12 total "very active" minutes a week, which exceeds the ACSM's recommended 75 minutes of vigorous activity a week. In addition to "very active"

activity, users are reported to average 13.56 minutes daily or 94.92 minutes weekly of “fairly active” activity. So, between the “very active” activity and “fairly activity” activity, users are averaging 243.04 minutes of activity a week.

In comparison to active minutes, let’s analyze users’ sedentary minutes. On average, users are sedentary for approximately 16.49 hours a day. Spending over two-thirds of your day can be detrimental to a person’s health and lead to obesity, CVD, and diabetes, per ACSM.

The analysis of daily calorie expenditure shows, on average, users burn 2304 calories a day. Calorie expenditure and consumption is dependent on the person and their goal, whether that is to lose weight, gain weight, or maintain their current weight. In order to lose weight, you must be in a calorie deficit. Depending on goals and how fast one wants to lose weight dictates how many calories a person should be in a calorie deficit, but in order to lose one pound of fat, you must burn 3500 calories more than you consume. In terms of gaining weight, one must consume more calories than they burn. Again, this depends on how much weight one wants to gain and how fast they want to do it. And lastly, weight maintenance is where calories burned and calories consumed are the same.

Heart rate:

Analyzing the heart rate data, it shows that users averaged a heart rate of 77 beats per minute (bpm), which is right in the middle of the “normal” range of 50-100 bpm, per ACSM. Heart rate is an important marker of heart health, determinate of CVD, and risk for heart attacks.

Sleep_day:

The data summary for sleep shows that users average about 7 hours of sleep per day. Recommendations say adults should be getting between 7-9 hours of sleep. Furthermore, data shows that users spent about 7.64 hours in bed, which equates to about 38.6 minutes awake in bed. Losing 40 minutes of sleep a night attributed to other activities while in bed would be a great place to start when looking for recommendations for users to increase sleep time.

Weight_log:

When looking at the weight_log dataset, the most important stat to analyze is BMI, as it is an estimate of body fat and risk for diseases. However, it is only a screening tool and does not take into consideration many other factors of the individual. Unfortunately, this dataset contained a

very low participation from users, so results will be skewed compared to what full participation results would show. Having said that, data shows that the average BMI is 25.19, which is categorized as “average”, according to ACSM.

**Share**

Key findings:

- Users are significantly under the recommended daily steps by almost 25%.
- A positive correlation between those that get in more total daily steps and more total daily calories burned.
- Users that spend more time getting ‘very active’ and ‘fairly active’ minutes in a day burn significantly more calories than users that don’t spend more time tracked as ‘sedentary minutes’.
- Of the 7 users that reported heart rate data, their average reported heart rate was 77 bpm, which is well within the normal range of 50-100 bpm, per ACSM.
- Users averaged approximately 7 hours of sleep per night.
- Users spent approximately 40 minutes awake in bed, which averages about 4.67 hours of lost sleep time per week.
- A positive correlation was shown between BMI and weight (pounds), thus, the more someone weighed, the higher their BMI was. The average reported BMI was 25.19, which is categorized as “Average” (ACSM).

Visuals:

**Figure 1.** Total Daily Steps vs Total Daily Calories Burned.

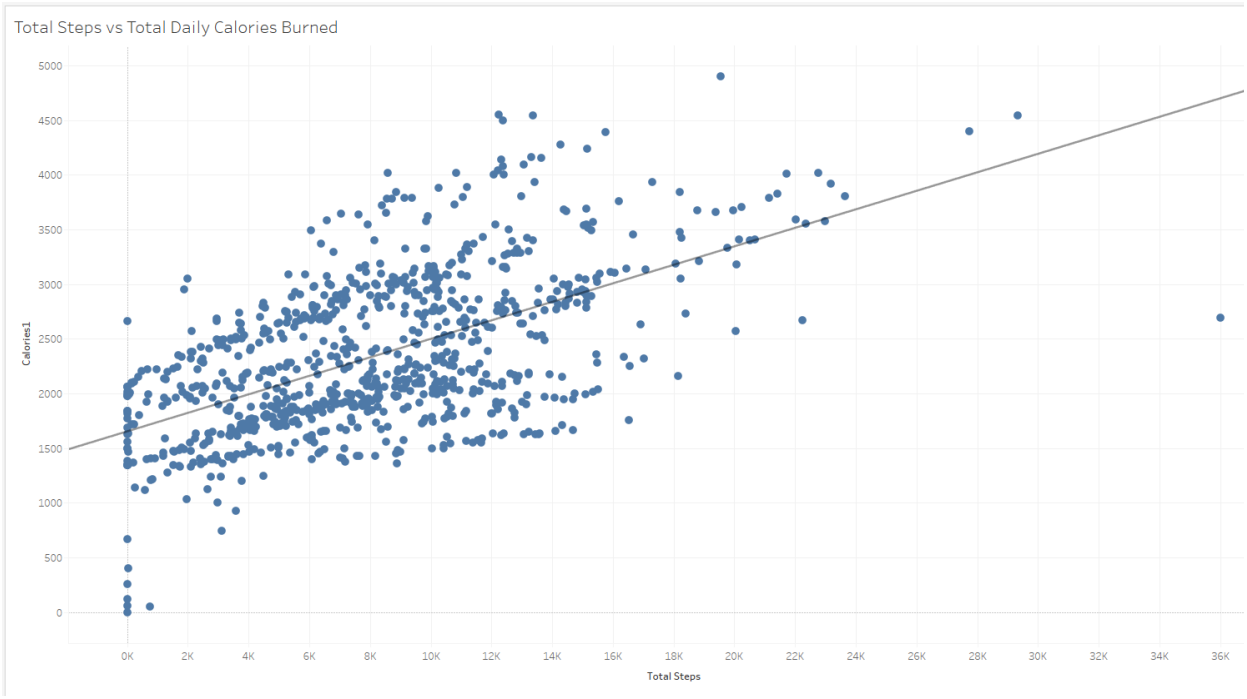


Figure 1 displays a positive relationship between total daily steps and total daily calories burned. This means that the steps someone gets in a day, the more calories they burn.

**Figure 2.** Active and Sedentary minutes vs Total Daily Calories Burned.

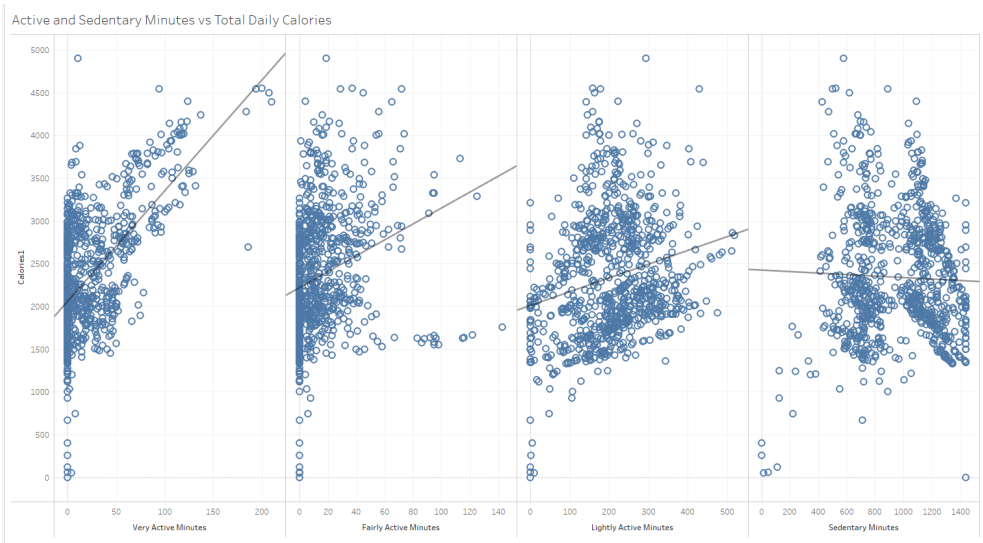


Figure 2 depicts the relationship of active and sedentary minutes and total daily calories burned.

The figures show that the more active minutes someone has during a day, the more calories

they burn. The figure comparing sedentary minutes and calories burned, shows the more daily sedentary minutes someone has, the less calories they will burn in a day.

**Figure 3.** User Average Heart Rate.

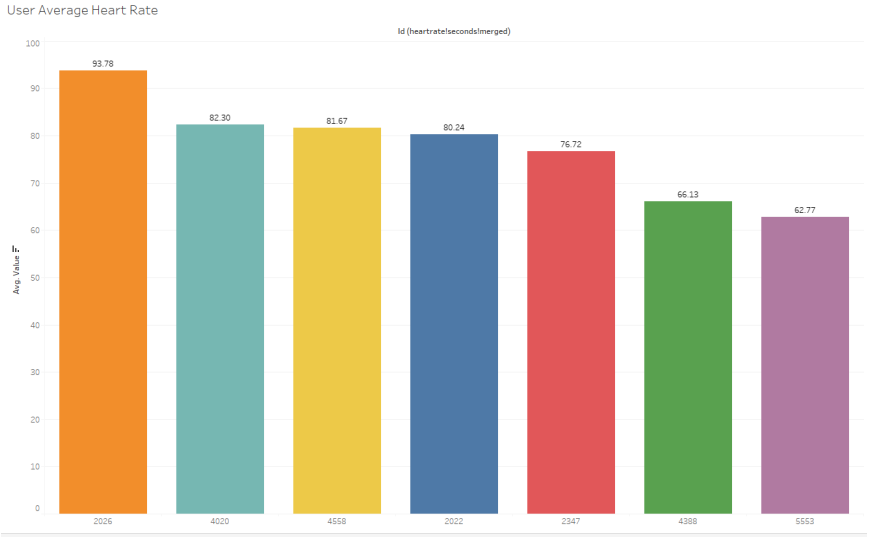


Figure 3 displays each reported user's average heart rate. All fall within the “normal range” of 50-100 bpm, per ACSM.

**Figure 4.** User Average Sleep.

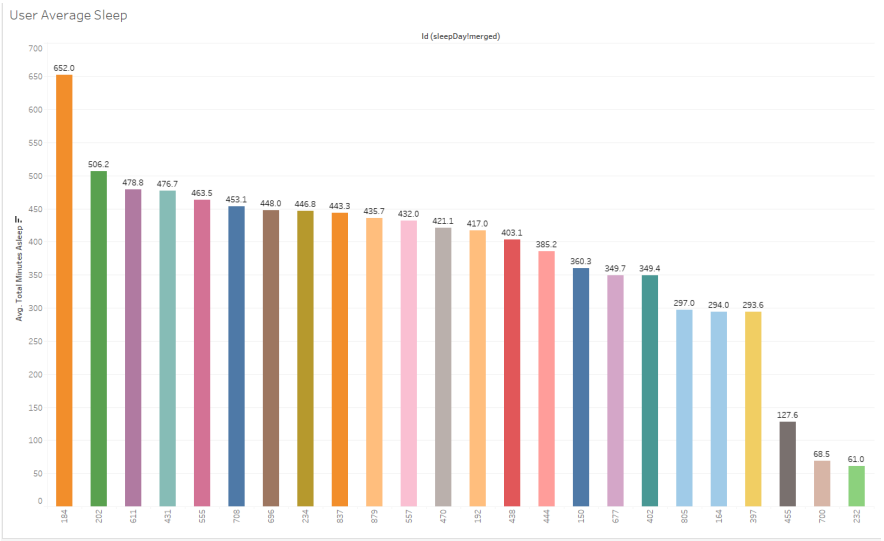


Figure 4 displays each reported user’s average sleep time (in minutes). Values range from 652 minutes down to 61 minutes, which we would assume is a data reporting error.

**Figure 5.** User BMI vs Weight.

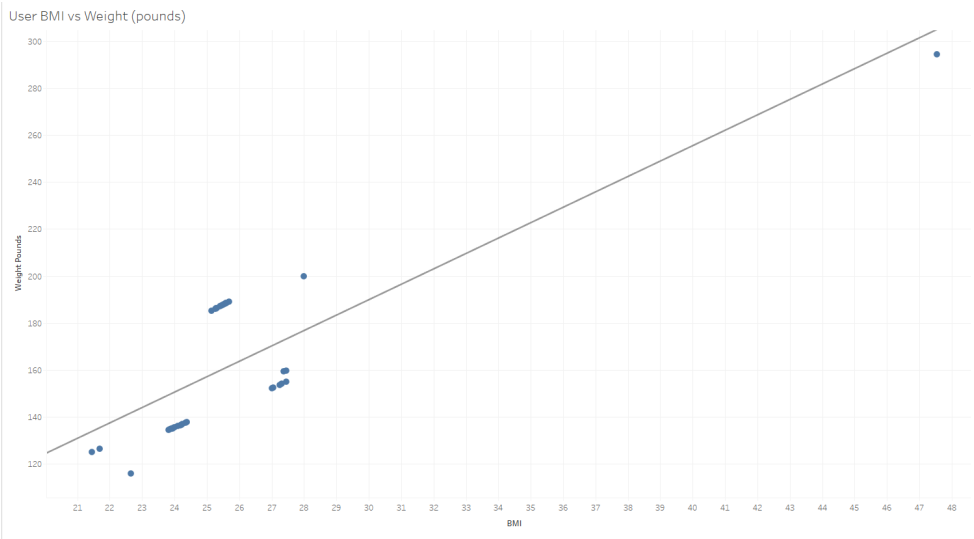


Figure 5 displays a positive correlation between BMI and weight (in pounds). This means that the higher someone's BMI is, the more they weigh.

## Act

Recommendations:

- Simplify the process where the user is required to enter information (activities, weight, etc.) and show the benefit of entering information to provide more accurate results for the user. Assistance with setup of device, account, and app could be done at sale of product.
- Market the product on the key features and benefits that consumers are using, compared to the unique features a device may offer. Steps, daily activity, calories, and sleep are the most commonly used features, thus, should be the most marketed.
- The app can be further developed and used to promote healthy lifestyle goals. Within the app, set up challenges and goals for users to complete, such as daily steps, amount of sleep, and daily calories burned. Furthermore, allow friends to connect on the app and create challenges against one another, such as daily steps or daily burned calories.
- Create social media groups/communities that allow users to post their workouts, challenges, wellness tips and tricks, etc.

- Enable features, in products such as Time, that alerts users after a prolonged period of sedentary minutes, signaling the user to get active. Additionally, user's can program in ideal bedtimes and the watch can remind the user to wind down and get ready for bed.
- Offer reward points for products and the membership program for users that complete their goals. For example, a user completes their daily goal of 10,000 steps. They are rewarded 25 points. At 1000 points, user is rewarded with a one month free subscription to the Bellabeat membership program.

**Sources**

"ACSM: The American College of Sports Medicine." ACSM_CMS, https://www.acsm.org/.