

Bellabeat Capstone Case Study: Smart Fitness Device Usage



This case study analyzes fitness tracker data to uncover consumer behavior patterns related to smart device usage. The insights derived from daily activity, sleep, and heart rate data will inform strategic marketing recommendations for Bellabeat, a company focused on women's wellness technology. By understanding user habits, Bellabeat can enhance product features and tailor marketing messages to better serve its diverse customer base.

by YASHKUMAR BILWAL

Understanding Consumer Behavior: The Business Task

Bellabeat aims to leverage data-driven insights to refine its product development and marketing strategies. The core objective is to analyze existing smart device usage patterns to understand how consumers interact with their fitness trackers, specifically focusing on activity levels, sleep quality, and heart rate data. This analysis seeks to answer critical business questions:

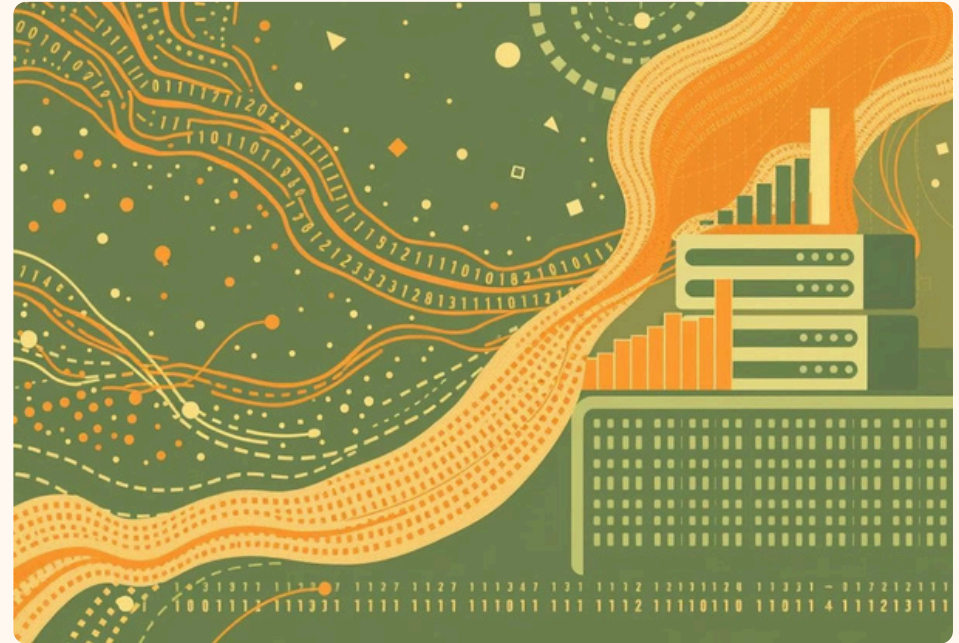
- What are the common patterns in daily steps, sleep duration, and heart rate among smart device users?
- How can Bellabeat apply these observed patterns to its target customer base to enhance engagement?
- What data-driven marketing strategies can be developed to improve product promotion and user adoption?

The ultimate goal is to generate actionable recommendations that will allow Bellabeat to "play it smart" in the competitive wellness technology market.

Data Preparation: Source, Structure, and Tools

The analysis utilizes the publicly available Fitbit Fitness Tracker Data from Kaggle, collected between March and May 2016. This dataset includes anonymized data from 33 unique Fitbit users, providing a snapshot of real-world usage patterns. The following key files were used:

- **dailyActivity_merged.csv:** Contains daily records of steps, calories burned, and overall activity levels.
- **sleepDay_merged.csv:** Detailed logs of sleep duration and time spent in bed.
- **heartrate_seconds_merged.csv:** Granular second-by-second heart rate data, offering deep insights into physiological responses.



The primary tools for data preparation, cleaning, and analysis were R, specifically leveraging packages such as **tidyverse** for data manipulation, **ggplot2** for visualization, and **lubridate** for efficient date and time handling. These tools enabled robust processing of the diverse data types and preparation for insightful analysis.

Data Processing: Cleaning and Validation

Rigorous data cleaning was essential to ensure the accuracy and reliability of the analysis. Each dataset underwent specific transformations and validations:

Daily Activity Data

The 'ActivityDate' column was converted to a proper date format using `lubridate::mdy()`. After conversion, the dataset was verified to contain 940 records with no missing values or duplicates. It confirmed the presence of data from 33 unique users.

Sleep Data

The 'SleepDay' column was converted to datetime format using `mdy_hms()`, and 'SleepDate' was extracted. This dataset showed no missing values or duplicates, indicating clean and consistent sleep logs.

Heart Rate Data

The 'Time' column was converted to datetime format using `mdy_hms()`, and the 'Date' was extracted for daily aggregation. This file was the largest, comprising approximately 2.48 million records, highlighting the granularity of the heart rate tracking.

Key Findings: Unpacking User Behavior

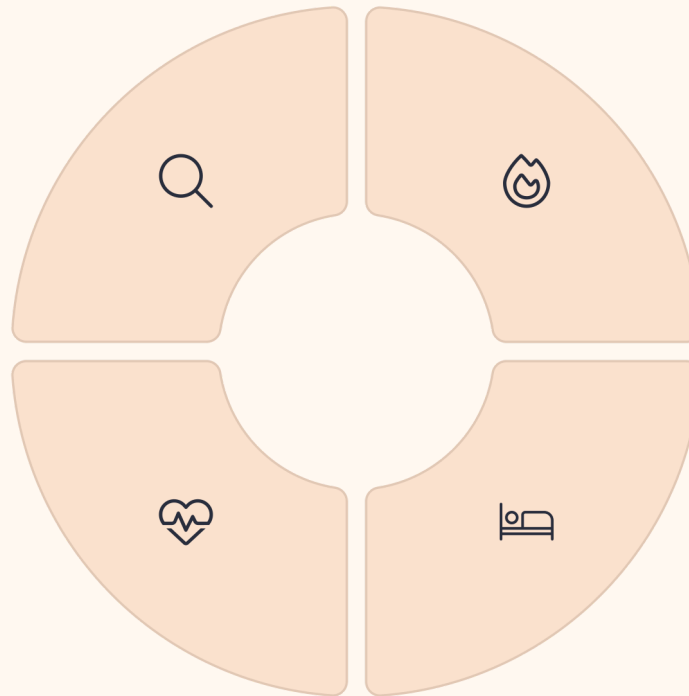
Analysis of the processed data revealed several significant patterns in user behavior:

Steps

Users averaged 7,638 steps/day (median 7,406). Most fell within 3,000-311,000 steps, with a right-skewed distribution indicating some highly active individuals. This suggests a varied user base, from casual to dedicated movers.

Heart Rate

The average resting heart rate ranged from 65-85 bpm, generally within healthy limits. Nonetheless, outliers exceeding 95 bpm were noted, which could indicate stress or underlying health considerations for those individuals.



Calories Burned

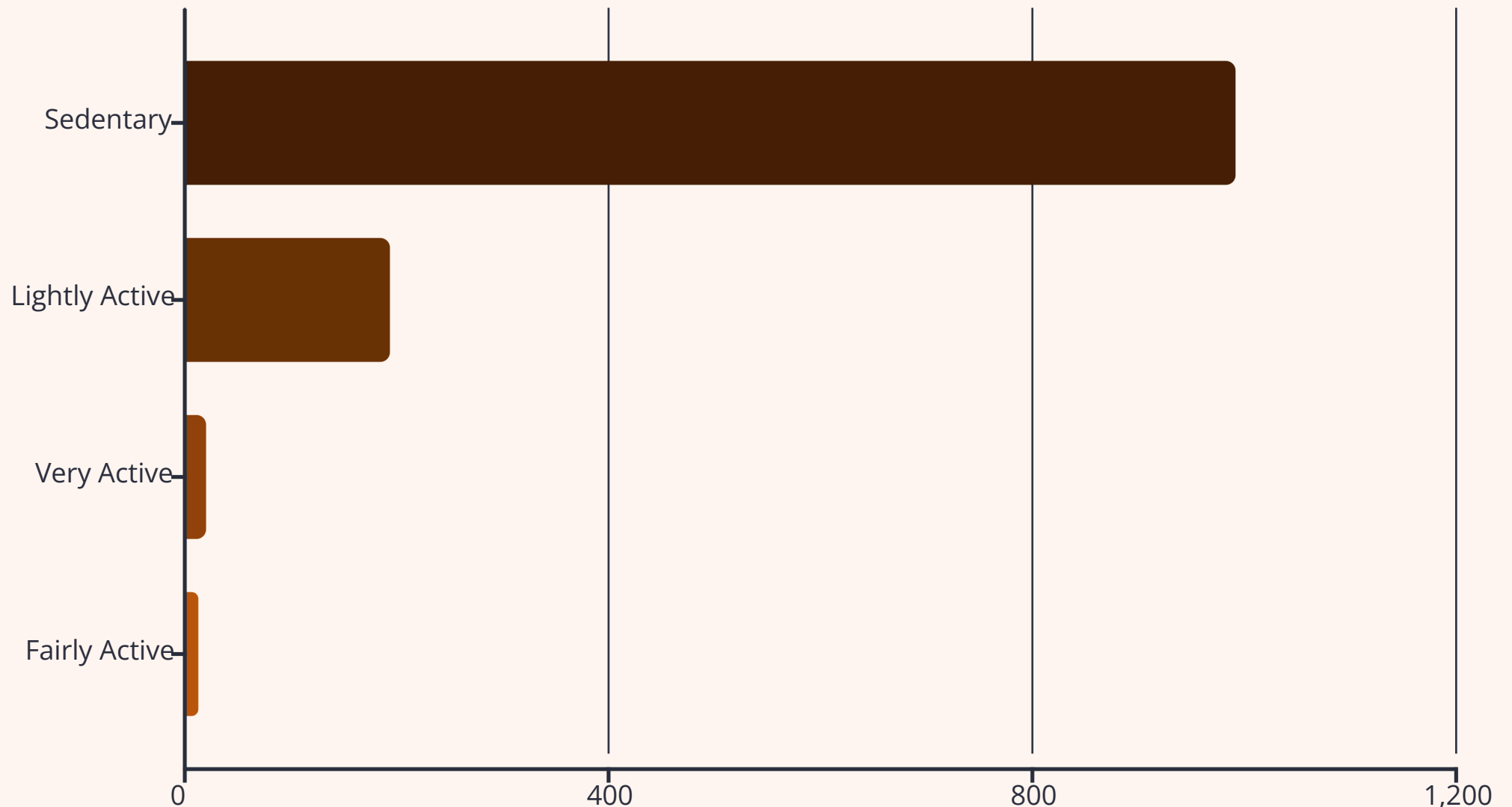
The mean daily calorie burn was approximately 2,304 kcal. A positive correlation ($cor = 0.59$) was observed between steps and calories, reinforcing that increased physical activity directly translates to higher energy expenditure.

Sleep Patterns

Users averaged 7.6 hours in bed and 7.0 hours of actual sleep, yielding a high sleep efficiency (90- 100%) for most. However, some users exhibited lower efficiency (<80%), pointing to potential sleep disturbances.

Activity Time Breakdown

A detailed look into activity types highlights the predominantly sedentary nature of users, alongside pockets of significant activity. This distribution presents a clear opportunity for Bellabeat to encourage more movement throughout the day.



The chart clearly shows that users spend the vast majority of their time in a sedentary state, approximately 16.5 hours per day. This significant portion of inactive time underscores the potential for Bellabeat to promote strategies for incorporating more light and moderate activity into daily routines.

Strategic Marketing Recommendations for Bellabeat

Based on the findings, Bellabeat can implement targeted marketing strategies to enhance user engagement and promote healthier lifestyles:



Promote Active Breaks

Encourage users to integrate short movement periods throughout their highly sedentary days. This could be through in-app reminders or notifications suggesting quick walks or stretches.



Step-Based Challenges

Implement daily or weekly step challenges within the Bellabeat app to drive calorie burn and foster user engagement. Gamification elements can boost motivation.



Smart Sleep Coaching

Offer personalized insights and recommendations based on individual sleep efficiency data. For users with low efficiency, provide tips or guided meditations to improve sleep quality.



Heart Rate Alerts

Develop features that highlight wellness trends through resting heart rate analytics, alerting users to potential stress or health issues, and encouraging them to consult professionals when needed.



Segmented Marketing

Tailor marketing content based on user activity levels (e.g., low-activity vs. highly active users) to resonate more effectively with different segments of the customer base.

Conclusion and Project Credits

This case study provides Bellabeat with actionable insights derived from real-world Fitbit user data, empowering the company to make data-driven decisions for product enhancement and marketing. By understanding the nuances of user behavior from sedentary periods to sleep quality and heart rate trends Bellabeat can strategically position its products to better meet the wellness needs of its target audience.

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Portfolio: yashbilwal.vercel.app

GitHub Repo: github.com/yashbilwal/Bellabeat-Case-Study