Fitbit business case study

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ABOUT FITBIT:

Fitbit, a renowned American consumer electronics and fitness company, specializes in producing wireless-enabled wearable technology. Their range includes smartwatches, pedometers, heart rate monitors, and sleep quality trackers. Fitbit also offers related software to complement their devices. In January 2021, Google acquired the company.

As of 2019, Fitbit stood as the fifth largest company in wearable technology shipments. Remarkably, Fitbit has successfully sold over 120 million devices and boasts a user base of 29 million individuals spread across more than 100 countries. The company, initially founded as Healthy Metrics Research, Inc. in San Francisco, California, on March 26, 2007, was established by James Park (CEO) and Eric Friedman (CTO). In October 2007, it rebranded itself as Fitbit, Inc.

PROBLEM STATEMENT:

"In this Fitbit case study, the problem at hand is to investigate the correlation between an individual's mood and specific parameters such as calories burned, hours of sleep, and step count. The study seeks to identify patterns and relationships between these variables to better understand how mood is influenced by physical activity and sleep patterns. By addressing this problem, we aim to provide valuable insights into the factors that impact an individual's mood, which can be crucial for enhancing overall well-being and promoting healthier lifestyle choices."

Question 1. Convert the rows of the data into columns and vice versa.

Answer:

We used the Transpose function from NumPy to convert the rows into columns and columns into rows.

```
[11]  data_t = data.T
```

Question 2. Find the dimension of data after transposing it.

Answer:

After applying the `ndim` function from NumPy, it was determined that the data is in 2D format indicating it has two dimensions.

```
[ ]  data_t.ndim

     2
```

Question 3. Find the shape of data after transposing it.

Answer:

After applying the `shape` function from NumPy, it was determined that the data has 6 rows and 96 columns.

```
[14]  data_t.shape

      (6, 96)
```

Question 4. Unpack the data and store into a variable.

Answer:

We unpacked the data and stored it into a variable 'data_t' for further analysing the Fitbit data.

```
[ ] date, step_count, mood, calories_burned, hours_of_sleep, activity_status = data_t
```

ANALYSIS ON THE STEP COUNT

Question 5. Find the average step counts when the mood of the person is happy.

Answer:

The dataset of step counts was converted into a NumPy array, optimizing it for efficient numerical computations. Data points were filtered to specifically isolate instances where individuals reported feeling 'Happy,' focusing on step count data corresponding to positive emotional states. The average step counts during happy moods were calculated and rounded to two decimal places, offering a precise measure of physical activity associated with positive emotions.

We utilized the NumPy Python library to analyse the data. Following the analysis, it was determined that, on average, a person takes 3392.72 steps when in a happy mood.

```
[50] step_count = np.array(step_count, dtype = "int")

[51] step_count_happy = step_count[mood == 'Happy']

[52] step_count_happy

     array([4732,  330, 4550, 4435, 4779, 1831, 2255,  539, 5464, 4068, 4683,
            4033, 6314,  614, 3149, 4005, 4880, 4136,  705,  269, 4275, 5999,
            4421, 6930, 5195,  546,  493,  995, 3608,  774, 1421, 4064, 2725,
            5934, 1867, 7422, 5537, 5376,  153, 2203])

[65] Mean_happy_stepcount = np.round(step_count_happy.mean(),2)

[66] Mean_happy_stepcount

     3392.72
```

Question 6. Find the average step counts when the mood of the person is neutral.

Answer:

To explore the connection between an individual's mood and their step counts, we initially filtered the dataset to focus on instances where the mood was reported as 'Neutral.' This selective filtering allowed us to isolate data points corresponding to neutral emotional states. Subsequently, the filtered step count data was rounded off to ensure precision..

After analysing the data, it was discovered that the average number of steps a person takes when their mood is neutral is 3153.78.

```
[55] step_count_neutral = step_count[mood == 'Neutral']
```

```
[56] step_count_neutral
```

```
array([5464, 6915, 3158, 4383, 3881, 4037,  202,  292, 2209, 6041,  570,
       1163, 2374, 2909, 7102, 3941,  437, 1231, 4921, 6500, 3575, 4108,
       3066, 1447, 2599,  500, 2127])
```

```
[67] Mean_neutral_stepcount = np.round(step_count_neutral.mean(),2)
```

```
[68] Mean_neutral_stepcount
```

```
3153.78
```

Question 7. Find the average step counts when the mood of the person is sad.

Answer:

We then filtered the dataset to focus on instances where the mood was reported as 'Sad.' After analysing the data, it was determined that the average number of steps a person takes when they are feeling sad is 2103.07.

This analysis provided valuable insights into the average step counts associated with sad moods, shedding light on the relationship between emotional state and physical activity levels.

```
[57] step_count_sad = step_count[mood == 'Sad']
```

```
[58] step_count_sad
```

```
array([6041,   25, 5461, 4545, 4340, 1230,   61, 1258, 3148, 4687, 3519,
       1580, 2822,  181, 6676, 3721, 1648,  799, 1696,  221, 4061,  651,
        753,  518,  177,   36,  299,  702,  133])
```

```
[69] Mean_sad_stepcount = np.round(step_count_sad.mean(),2)
```

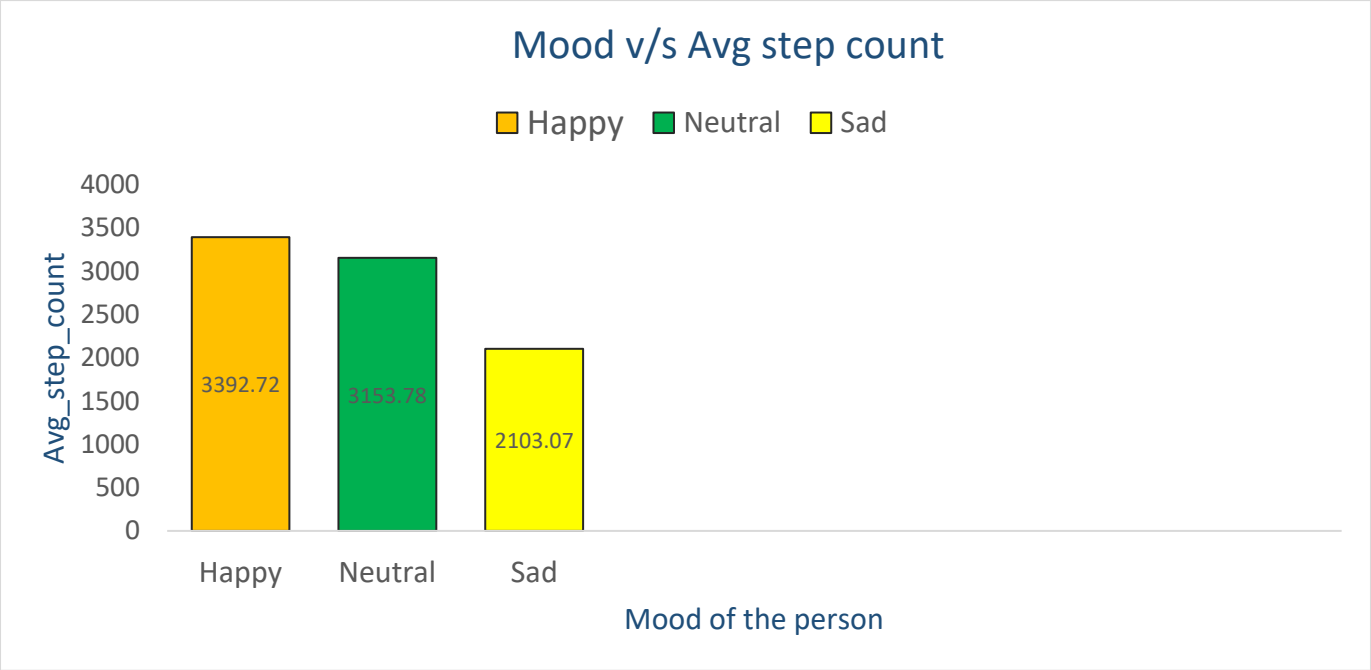
```
[70] Mean_sad_stepcount
```

```
2103.07
```

Table of Average step counts:

Mood of the person	Avg step count
Happy	3392.72
Neutral	3153.78
Sad	2103.07

We created a bar chart to represent the relationship between a person's mood and their average step counts. Upon analysing the data, it is evident that the individual takes the highest number of steps when in a happy mood, totalling 3392.72 steps. In a neutral mood, they take 3153.78 steps, while the fewest steps were taken when the person was sad, amounting to 2103.07 steps.



Insights:

- The person's mood significantly affects their physical activity level, measured in step counts. They take the highest number of steps when they are in a happy mood, indicating a positive correlation between happiness and physical activity.

- When in a neutral mood, the step count slightly decreases, suggesting a moderate decrease in physical activity compared to when they are happy.

- The fewest steps are taken when the person is sad, indicating a substantial decrease in physical activity during periods of sadness.

ANALYSIS ON THE CALORIES BURNED:

Question 8. Find the average calories burned when the mood of the person is happy.

Answer:

The dataset was converted into a NumPy array for efficient numerical processing. After that data points were filtered based on individuals reporting a 'Happy' mood. The average calories burned in happy states were calculated and rounded to two decimal places for precise analysis.

After analysing the relationship between a person's mood and the calories they burn, it was found that the average calories burned when the person is happy amount to 108.55 calories

```
[9]  calories_burned = np.array(calories_burned, dtype = "int")
```

```
[10] calories_burned_happy = calories_burned[mood == 'Happy']
```

```
[11] calories_burned_happy
```

```
array([150,  10, 150, 141, 156,  57,  72,  17, 181, 131, 154, 137, 193,
        19, 101, 139, 164, 137,  22,   9, 145, 192, 146, 234, 167,  16,
        17,  32, 116,  23,  44, 131,  86, 194,  60, 243, 180, 176,   0,
         0])
```

```
[12] Mean_happy_calories = np.round(calories_burned_happy.mean(),2)
```

```
[13] Mean_happy_calories
```

```
108.55
```

Question 9. Find the average calories burned when the mood of the person is neutral.

Answer:

We examined how the number of calories burned changes based on a person's mood. After analysing the data, it was determined that the average calories burned when the person is in a neutral mood amount to 98.70 calories.

```
[21] calories_burned_neutral = calories_burned[mood == 'Neutral']
```

```
[22] calories_burned_neutral
```

```
array([181, 223,  99, 143, 125, 129,   6,   9,  72, 197,  17,  35,  76,
        93, 227, 125,  14,  39, 158, 213, 116, 138,  99,  47,  84,   0,
         0])
```

```
[73] Mean_neutral_calories = np.round(calories_burned_neutral.mean(),2)
```

```
[74] Mean_neutral_calories
```

```
98.7
```

Question 10. Find the average calories burned when the mood of the person is sad.

Answer:

Finally, we investigated the calories burned when a person is feeling sad. After analysing the data, it was discovered that the average calories burned in this state amounted to 67.72 calories.

```
[19] calories_burned_sad = calories_burned[mood == 'Sad']
```

```
[20] calories_burned_sad
```

```
array([197,   0, 174, 149, 140,  38,   1,  40, 101, 152, 113,  49,  86,
         6, 220, 121,  53,  25,  55,   7, 129,  21,  28,  16,   5,   1,
        10,  23,   4])
```

```
[75] Mean_sad_calories = np.round(calories_burned_sad.mean(),2)
```

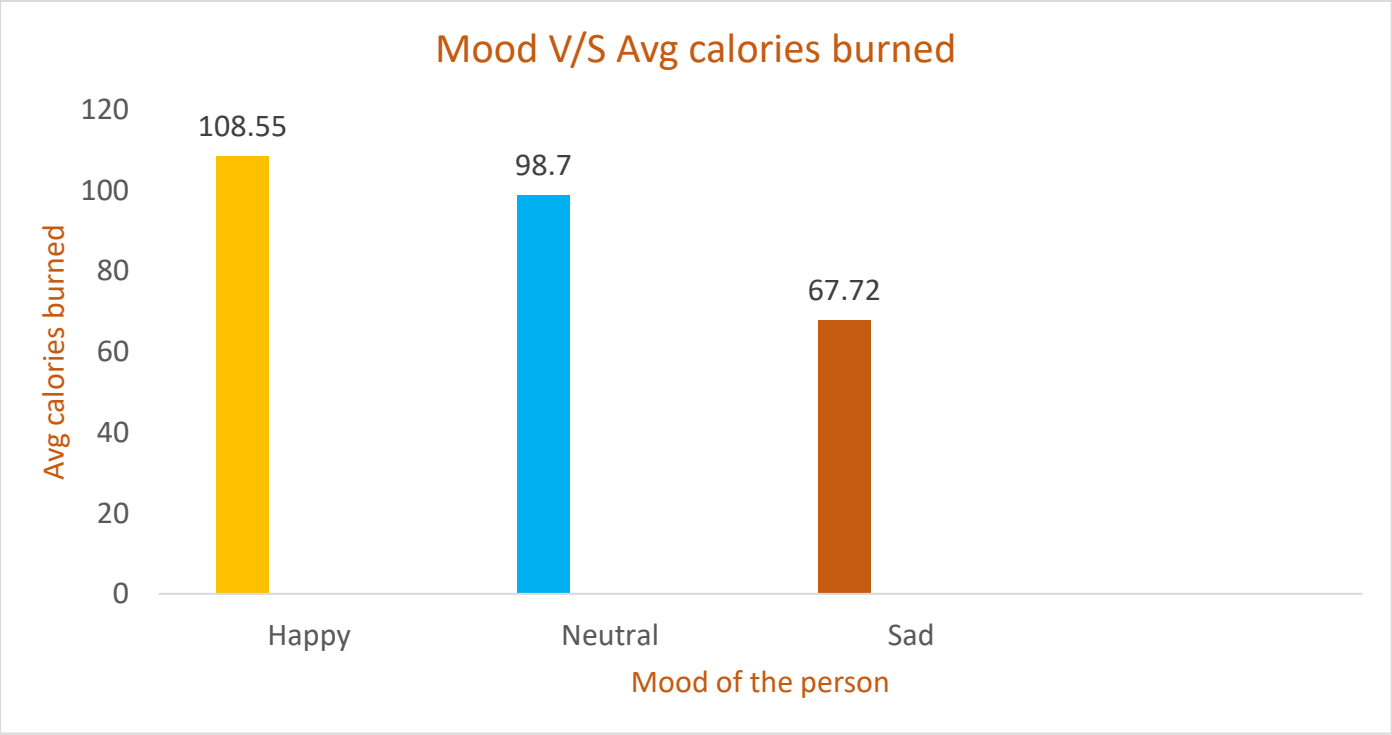
```
[76] Mean_sad_calories
```

```
67.72
```

Table of Average calories burned:

Mood of the person	Avg calories burned
Happy	108.55
Neutral	98.70
Sad	67.72

We generated a bar chart to illustrate the connection between a person's mood and the calories they burn. Upon analysing the chart, it became evident that the individual burns the maximum number of calories, 108.55 calories, when in a happy mood. The individual burns 98.70 calories when in a neutral mood. The least calorie burn was observed when the person was in a sad mood, totalling 67.72 calories.



Insights

- The individual burns the most calories when in a happy mood, indicating a higher energy expenditure during positive emotional states.

- When in a neutral mood, the calorie burn slightly decreases, suggesting a moderate decrease in energy expenditure compared to when they are happy.

- The least calorie burn occurs when the person is sad, indicating a significant decrease in energy expenditure during periods of sadness.

ANALYSIS ON THE HOURS OF SLEEP:

Question 11. Find the average hours of sleep when the mood of the person is happy.

Answer:

The dataset converted into a NumPy array, enabling efficient numerical operations. Data points were filtered to select instances where individuals reported being in a 'Happy' mood, focusing specifically on sleep data corresponding to happy states. The average hours of sleep during happy moods were calculated and rounded to two decimal places, providing a precise measure of sleep duration associated with positive emotions.

After conducting an analysis on the relationship between a person's mood and their hours of sleep it was found that the average hours of sleep when the person is happy amount to 5.72 hours.

```
[32] hours_of_sleep = np.array(hours_of_sleep, dtype = "int")
```

```
[33] hours_sleep_happy = hours_of_sleep[mood == 'Happy']
```

```
[34] hours_sleep_happy
```

```
array([6, 6, 8, 5, 4, 5, 4, 5, 4, 2, 9, 5, 6, 4, 5, 8, 4, 5, 6, 6, 5, 6,
       5, 6, 5, 6, 7, 6, 5, 6, 7, 8, 8, 7, 8, 5, 4, 5, 8, 5])
```

```
[77] Mean_happy_sleep = np.round(hours_sleep_happy.mean(),2)
```

```
[78] Mean_happy_sleep
```

```
5.72
```

Question 12. Find the average hours of sleep when the mood of the person is neutral.

Answer:

We examined the hours of sleep when a person's mood is neutral. We found that the average hours of sleep in this state are 4.67 hours.

```
[35] hours_sleep_neutral = hours_of_sleep[mood == 'Neutral']
```

```
[36] hours_sleep_neutral
```

```
array([5, 5, 5, 4, 5, 6, 8, 5, 5, 3, 5, 7, 4, 3, 5, 5, 3, 4, 5, 5, 5, 5,
       4, 3, 2, 5, 5])
```

```
[79] Mean_neutral_sleep = np.round(hours_sleep_neutral.mean(),2)
```

```
[80] Mean_neutral_sleep
```

```
4.67
```

Question 13. Find the average hours of sleep when the mood of the person is sad.

Answer:

We also investigated the hours of sleep when a person is feeling sad. It was found that the average hours of sleep in this state amount to 5.03 hours.

```
[37] hours_sleep_sad = hours_of_sleep[mood == 'Sad']
```

```
[38] hours_sleep_sad
```

```
array([8, 5, 4, 6, 6, 7, 5, 6, 8, 5, 7, 5, 6, 8, 6, 5, 3, 4, 4, 5, 5, 5,
       4, 3, 5, 3, 3, 3, 2])
```

```
[81] Mean_sad_sleep = np.round(hours_sleep_sad.mean(),2)
```

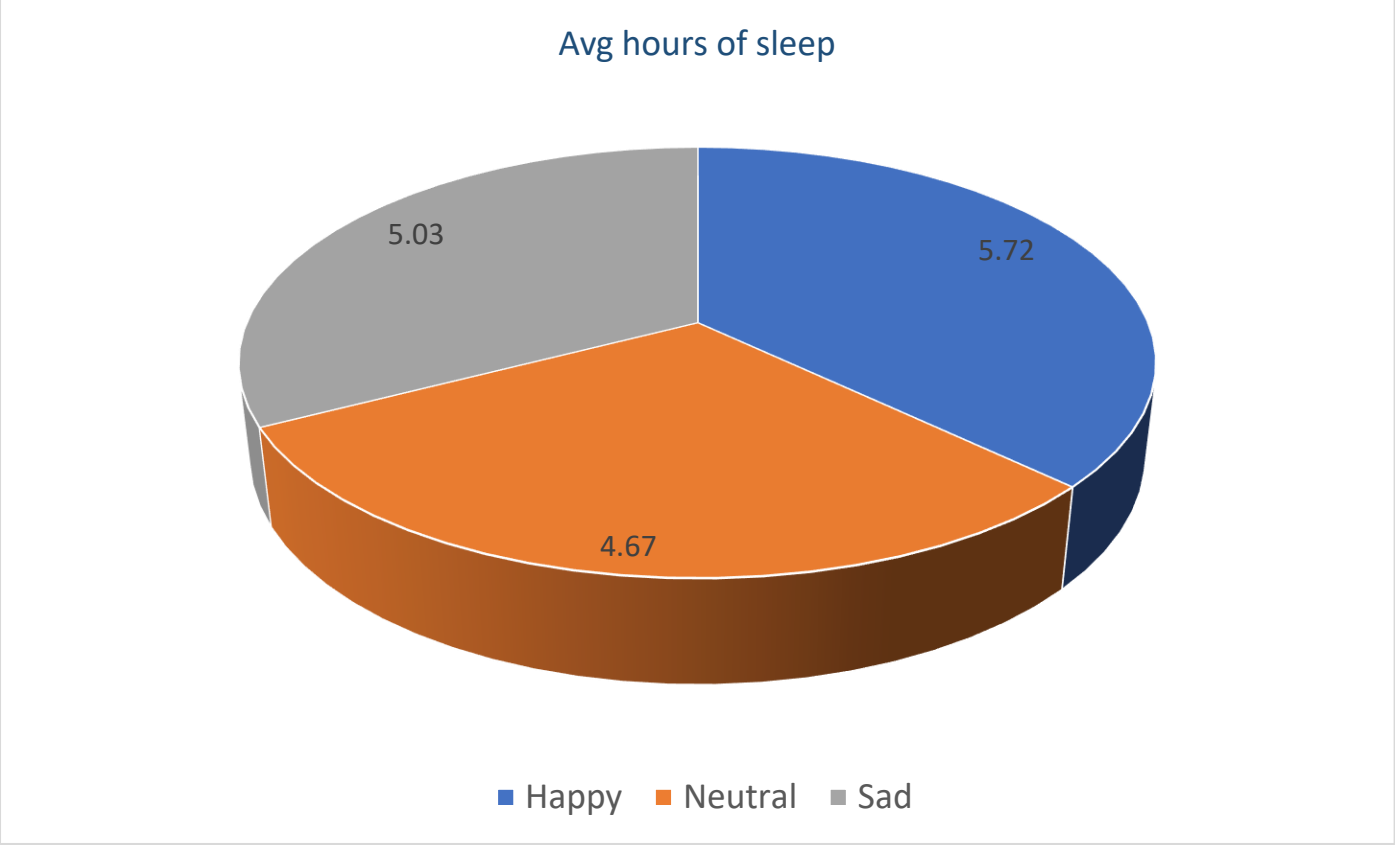
```
[82] Mean_sad_sleep
```

```
5.03
```

Table of Average hours of sleep:

Mood of the person	Avg hours of sleep
Happy	5.72
Neutral	4.67
Sad	5.03

We created a 3D pie chart depicting the relationship between a person's mood and their average hours of sleep. The analysis revealed that individuals sleep the longest, averaging 5.72 hours, when they are happy. Following this, when a person is sad, they sleep for an average of 5.03 hours. Conversely, the shortest duration of sleep was observed when the person was in a neutral mood.



Insights

- Individuals sleep the longest hours when they are happy, indicating a positive correlation between happiness and the duration of sleep.

- When in a sad mood, the average sleep duration is 5.03 hours, showing a moderate decrease in sleep compared to when they are happy.

- The shortest sleep duration is observed when the person is in a neutral mood, suggesting a significant decrease in sleep duration during periods of emotional neutrality.

Insights based on the analysis

1)Happiness seems to be a motivating factor, encouraging higher physical activity, as evident from the highest step counts recorded during happy moods.

2)We noticed a 61.22% increase in step counts when individuals were in a happy mood compared to a sad mood and 7.57% rise in step counts as compared to a neutral mood.

3)Positive emotions, particularly happiness, are associated with higher calorie burn, possibly due to increased physical activity and energy expenditure.

4)We noticed a 60.29% increase in calorie expenditure when individuals were in a happy mood compared to a sad mood and 9.97% rise in calories burned as compared to a neutral mood.

5)Happiness is linked to longer sleep duration, indicating a potential positive impact on sleep quality and overall well-being.

6)We observed a 22.49% increase in sleep hours when individuals were in a happy mood compared to a neutral mood and 13.71% rise in sleep hours as compared to a sad mood.

7)When in sad mood we can observe low number of step counts & less calorie burn indicating a substantial decrease in physical activity & energy expenditure during periods of sadness.

8) The shortest sleep duration is observed when the person is in a neutral mood, suggesting a significant decrease in sleep duration during periods of emotional neutrality.

9)Based on the above analysis we can see influence of mood on physical activities, calorie burn, and sleep patterns. Positive emotions, particularly happiness, are associated with higher physical activity levels, increased calorie burn, and longer sleep duration, indicating the importance of emotional well-being in maintaining a healthy lifestyle.

Recommendation based on the insights

Fitbit can consider the following recommendations to enhance their products and services:

1. Develop Mood-Tracking Features:

- Fitbit could consider integrating mood-tracking features into their devices. Users could input their mood daily, and Fitbit could provide insights and correlations similar to those described in your data. This feature could help users better understand the connection between their emotional well-being and physical health.

2. Personalized Activity Goals:

- Fitbit could use mood data to personalize daily activity goals. For instance, on days when a user report feeling happy, the device could encourage slightly more ambitious activity targets, motivating the user to capitalize on their positive mood for increased physical activity.

3. Integrate Mental Health Support:

- Fitbit could partner with mental health professionals or apps to offer guided meditation sessions or mood-boosting exercises directly through the Fitbit platform. Integrating mental health support can enhance the overall well-being of users and provide holistic health solutions.

4.Sleep Quality Improvement:

- Fitbit could develop features to enhance sleep quality. Since happiness is associated with longer sleep duration, Fitbit could provide personalized sleep recommendations to users during periods of stress or low mood, encouraging them to prioritize sleep.

5.Gamification and Rewards:

- Fitbit could introduce gamification elements related to mood and physical activity. Users could earn rewards or badges for reaching activity goals during different mood states, providing positive reinforcement and encouraging consistent physical activity.

6.Community and Social Support:

- Fitbit could create a community space within their app where users can share their mood-related fitness achievements and experiences. Creating a supportive community can help users feel connected and motivated, reinforcing positive behaviours.

7.Data-Driven Insights:

- Fitbit can provide users with detailed insights about their mood and physical activity patterns over time. These insights can empower users to make informed decisions about their lifestyle, helping them understand how their emotions impact their physical health.

8.Research and Development:

- Fitbit could invest in further research to explore the relationship between mood, physical activity, and overall well-being. Continued research can lead to more advanced algorithms and features, providing users with increasingly accurate and personalized recommendations.

By implementing these recommendations, Fitbit can not only enhance user experience but also position itself as a comprehensive health and well-being platform, addressing both physical and emotional aspects of health.