

## Case Study: Optimizing Gym Services

### Scenario:

You are a data analyst at "Evolve Wellness," a family-owned fitness center. The management team has noticed a decline in member retention and wants to improve its services to better meet the needs of its clientele. They believe that a deeper understanding of member workout habits and preferences is the key to creating more effective and personalized gym programs.

### Objective:

Your task is to analyze a dataset of gym member activity to identify key trends and answer a critical business question that will help the management team make a data-driven decision. You will need to present your findings clearly and concisely.

### The Data:

You have been provided with a dataset containing the following columns:

- Age: Age of the gym member.
- Gender: Gender of the gym member (Male or Female).
- Weight (kg): Member's weight in kilograms.
- Height (m): Member's height in meters.
- Max\_BPM: Maximum heart rate (beats per minute) during workout sessions.
- Avg\_BPM: Average heart rate during workout sessions.
- Resting\_BPM: Heart rate at rest before workout.
- Session\_Duration (hours): Duration of each workout session in hours.
- Calories\_Burned: Total calories burned during each session.
- Workout\_Type: Type of workout performed (e.g., Cardio, Strength, Yoga, HIIT).
- Fat\_Percentage: Body fat percentage of the member.
- Water\_Intake (liters): Daily water intake during workouts.
- Workout\_Frequency (days/week): Number of workout sessions per week.
- Experience\_Level: Level of experience, from beginner (1) to expert (3).
- BMI: Body Mass Index, calculated from height and weight.

### The Question:

Your specific task is to answer the following question:

**"Are there specific workout types that are associated with higher calorie burn and session duration for certain age groups, and does this relationship vary by gender?"**

### Instructions:

1. Use the provided dataset to perform your analysis.
2. Use a pivot table or another data analysis method to find the answer.
3. Prepare to present your findings clearly, using visualizations where appropriate to support your conclusions.

---

## Analysis

Evolve Wellness is a family-owned fitness center dedicated to delivering a personalized and effective workout experience for all its members. The facility offers a comprehensive range of amenities, including cardiovascular and strength training equipment, as well as group exercise classes such as yoga, HIIT, and cardio. To ensure member satisfaction and help individuals achieve their goals, Evolve Wellness utilizes data analytics to gain a deeper understanding of workout habits and preferences. This approach allows the center to continuously optimize its programs and services to meet the specific needs of its diverse clientele.

As a data analyst for Evolve Wellness, in this case study, I was tasked with analyzing a dataset of gym member activity to identify key trends. My insights will address a critical business question and help guide the management team to make informed, data-driven decisions.

This study will use the six phases of data analysis, which are;

- Ask
- Prepare
- Process
- Analyze
- Share
- Act

### Ask

Evolve Wellness strives to understand the habits and preferences of its members, enhancing its services to better meet the needs of its clientele.

The key stakeholder is:

- The management team

### Prepare

The dataset for this case study is available by clicking the link below:



[Gym Members Exercise Dataset](#)

This dataset was published by Vala Khorasani on Kaggle and is licensed under the Apache 2.0 license.

According to the information on Kaggle, the data in this study were synthetically generated to reflect real-world gym member activity, drawing on insights from publicly available health data

and surveys on exercise habits and physiological responses. Since the dataset was synthetically created, it is intended for use in projects or analysis, rather than for research purposes.

I downloaded the dataset in a zip file, saved it as a CSV file, and uploaded the CSV file with fifteen columns to Google Sheets. I analyzed the data to familiarize myself with it and made these observations:

- The data was stored in a long format because each row contained a single data point for an individual member.
- The dataset contained 973 entries, as stated on Kaggle.
- Although it seemed that each row represented an individual data entry, the absence of an identifiable number associated with each entry made it unclear whether there were duplicates in the dataset. Duplicate data could cause skewed metrics, inaccurate counts, or confusion during data retrieval. An ID number associated with each entry would improve the validity and accuracy of the analysis and, thus, the recommendations.

### Process

To answer the question, I used the following columns:

- Age
- Gender
- Session Duration (hours)
- Calories Burned
- Workout Type

Cleaning was done using Google Sheets, where I originally uploaded the CSV file.

- One sheet had the original dataset, one had a copy, and a third sheet had the six columns I needed.
- I used the spellcheck and trim whitespace functions, but there were no spelling errors or whitespace that needed to be trimmed.
- I checked for blanks

### Analyze

To prepare the data for a pivot table, I found my key variables:

- Independent variables: Workout Type, Age, Gender
- Dependent variables: Calories Burned and Session Duration (hours)

For easier analysis, I divided the ages into groups. I found the minimum age using the =MIN function, which was 18 years old, and =MAX to find the maximum age, which was 57 years old.

The age groups were as follows:

- "18-24" if the age is less than 25
- "25-34" if the age is less than 35
- "35-44" if the age is less than 45
- "45-54" if the age is less than 55
- "55+" for all ages 55 and over

I created a new column named Age Groups and inserted the function “=IF(A2<25, "18-24", IF(A2<35, "25-34", IF(A2<45, "35-44", IF(A2<55, "45-54", "55+"))))” and applied it to the rest of the column so each age corresponded with a group.

For the pivot table:

I placed “Workout Type” and “Age Groups” in the Rows section and “Gender” in the Columns section. I placed “Calories Burned” and “Session Duration (hours)” in the Values Section, and I summarized by “Average” instead of “COUNTA” since it is helpful for comparison. I placed the Workout Type in descending order.

Age Groups	Workout Type	Gender		Values			
		Female		Male		Grand Total	
		AVERAGE of Calories Burned	AVERAGE of Session Duration (hours)	AVERAGE of Calories Burned	AVERAGE of Session Duration (hours)	AVERAGE of Calories Burned	AVERAGE of Session Duration (hours)
17-24	Yoga	884.8235294	1.224705882	942.7	1.175	916.1081081	1.197837838
	Strength	909.65	1.238	1024.666667	1.264444444	964.1315789	1.250526316
	HIIT	882.9166667	1.23	1110.368421	1.424210526	983.4186047	1.315813953
	Cardio	938.7692308	1.300769231	924.4285714	1.164285714	932.3617021	1.239787234
17-24 Total		906.1264368	1.251954023	997.5384615	1.253461538	949.3393939	1.252666667
25-34	Yoga	971.04	1.3508	934.037037	1.205925926	951.8269231	1.275576923
	Strength	857.7931034	1.267586207	1059.029412	1.322647059	966.3968254	1.297301587
	HIIT	954.5	1.31	975.4230769	1.278461538	967.452381	1.29047619
	Cardio	837.0571429	1.179428571	969.0357143	1.263571429	895.7142857	1.216825397
25-34 Total		892.5809524	1.26447619	988.8695652	1.270869565	942.9136364	1.267818182
35-44	Yoga	898.2333333	1.309	926.6774194	1.25483871	912.6885246	1.28147541
	Strength	876.6666667	1.28962963	908.78125	1.1678125	894.0847458	1.223559322
	HIIT	884.1428571	1.285238095	978.1333333	1.313	939.4313725	1.301568627
	Cardio	842.5217391	1.20173913	972.7058824	1.245882353	920.1754386	1.228070175
35-44 Total		876.8514851	1.274455446	946.6456693	1.244251969	915.7280702	1.257631579
45-54	Yoga	845.5384615	1.348846154	934.2222222	1.321388889	897.0322581	1.332903226
	Strength	841.8125	1.2825	917.5882353	1.275882353	880.8484848	1.279090909
	HIIT	822.2894737	1.272105263	946.0357143	1.309285714	874.7878788	1.287878788
	Cardio	753.2592593	1.146666667	851.0606061	1.204545455	807.05	1.1785
45-54 Total		817.1300813	1.263495935	911.480916	1.277557252	865.7913386	1.270748031
55+	Yoga	710	1.0825	815.8421053	1.142105263	784.4814815	1.124444444
	Strength	832.2666667	1.300666667	827.5882353	1.161764706	829.78125	1.226875
	HIIT	851.125	1.27	838.8181818	1.101818182	844	1.172631579
	Cardio	784.2	1.223333333	974.1538462	1.317692308	872.3928571	1.267142857
55+ Total		798.6086957	1.232173913	857.6833333	1.178333333	832.0471698	1.201698113
Grand Total		862.2489177	1.260822511	944.4559687	1.252446184	905.4224049	1.256423433

## Workout Type

To identify which workout types consistently had the highest average calories burned and longest session durations, I created two charts with corresponding graphs:

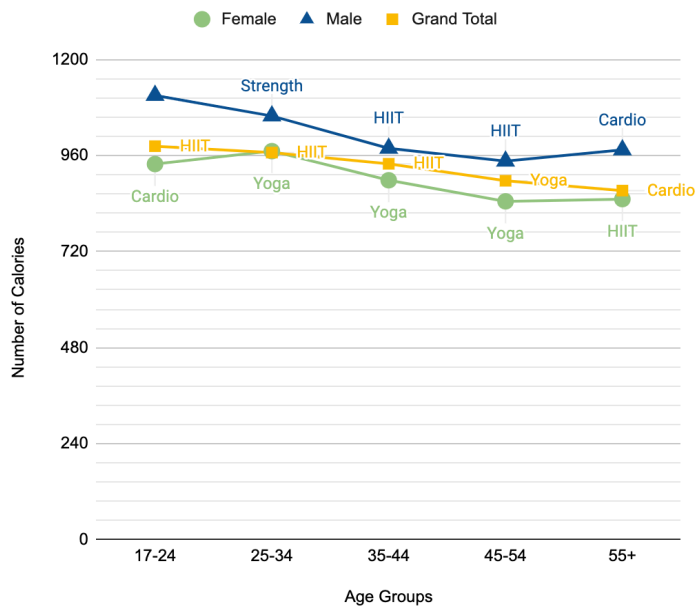
Highest Average Calories Burned

Age Groups	Female	Workout Type	Male	Workout Type	Grand Total	Workout Type
17-24	938.7692308	Cardio	1110.368421	HIIT	983.4186047	HIIT
25-34	971.04	Yoga	1059.029412	Strength	967.452381	HIIT
35-44	898.2333333	Yoga	978.1333333	HIIT	939.4313725	HIIT
44-54	845.5384615	Yoga	946.0357143	HIIT	897.0322581	Yoga
55+	851.125	HIIT	974.1538462	Cardio	872.3928571	Cardio

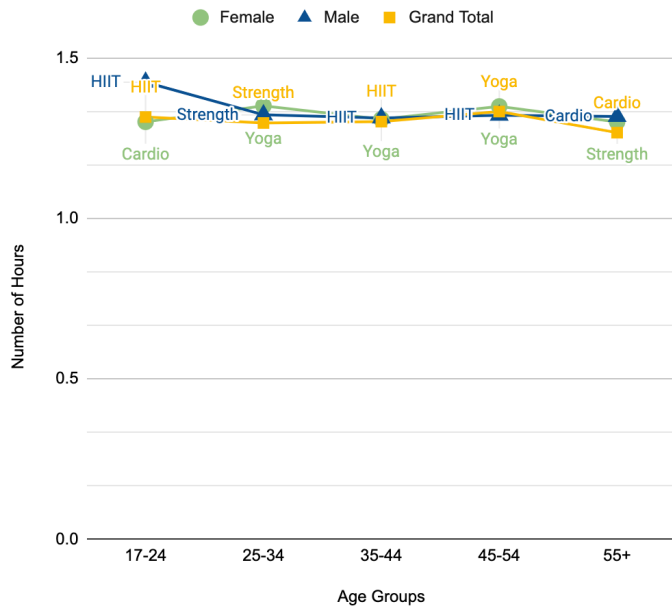
#### Highest Average Session Duration (hours)

Age Groups	Female	Workout Type	Male	Workout Type	Grand Total	Workout Type
17-24	1.300769231	Cardio	1.424210526	HIIT	1.315813953	HIIT
25-34	1.3508	Yoga	1.322647059	Strength	1.297301587	Strength
35-44	1.309	Yoga	1.313	HIIT	1.301568627	HIIT
44-54	1.348846154	Yoga	1.321388889	HIIT	1.332903226	Yoga
55+	1.300666667	Strength	1.317692308	Cardio	1.267142857	Cardio

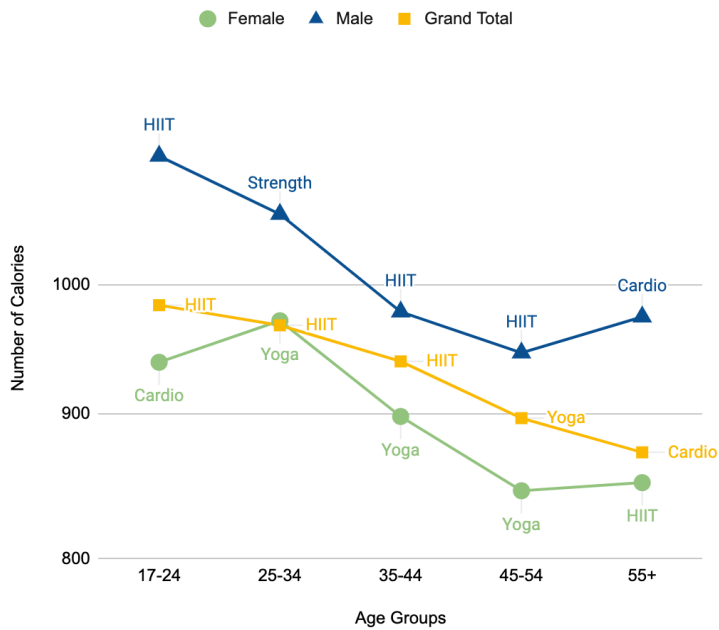
## Highest Average Calories Burned



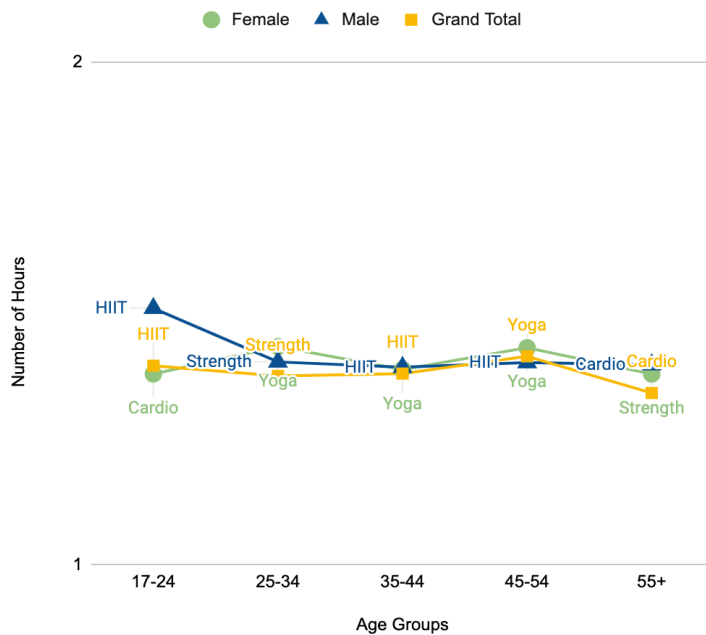
## Highest Average Session Duration



## Highest Average Calories Burned



## Highest Average Session Duration



While a general correlation existed between session duration and calories burned, the data revealed significant variability at the granular level when analyzing specific workout types. There were significant variations based on age and gender. The workout types that resulted in the highest calories burned and longest session duration for each age group were HIIT (17-24), HIIT

(35-44), Yoga (45-54), and Cardio (55+). For the 25-34 age group, HIIT resulted in the highest calorie burn, while Strength training had the longest session duration.

These results did vary by gender. The workout types that coincided with the highest calories burned and longest session duration for females were Cardio (17-24) and Yoga (25-34, 35-44, 45-54). For the 55+ age group, HIIT resulted in the highest calorie burn, while Strength training had the longest session duration. The workout types that coincided with the highest calories burned and the longest session duration for males were HIIT (17-24), Strength (25-34), HIIT (35-44), and Cardio (55+). For the 45-54 age group, HIIT resulted in the highest calorie burn, while yoga had the longest session duration.

For the visualization:

To effectively compare the two metrics, which were on different scales, I created two separate charts. To better illustrate the subtle differences and trends in session duration, I adjusted the x-axis to begin at 1 hour instead of zero. The calories burned x-axis was adjusted to start at 800 to provide a more comparable visual representation of the trends across both metrics.

These findings suggested that while workout duration is a contributing factor, other variables, such as workout intensity and individual physical characteristics, may also play a significant role in determining caloric expenditure, especially within specific demographics.

### Age Group

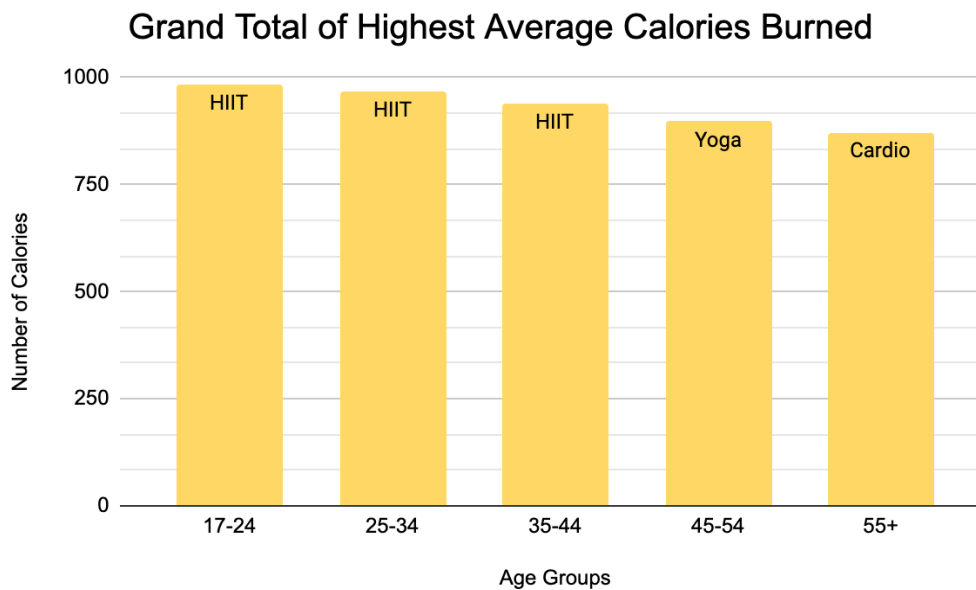
This analysis explored how the "most effective" workout type—defined by the highest average calorie burn—shifted through different age groups.

To determine if the HIIT workouts varied across age groups and which workout type was the most effective, I utilized the data chart from the previous analysis.

#### Highest Average Calories Burned

Age Group	Grand Total	Workout Type
17-24	983.4186047	HIIT
25-34	967.452381	HIIT
35-44	939.4313725	HIIT
45-54	897.0322581	Yoga
55+	872.3928571	Cardio





- For the 18-24 age group, “HIIT” had the highest average calorie burn
- For the 25-34 age group, “HIIT” had the highest average calorie burn
- For the 35-44 age group, “HIIT” had the highest average calorie burn
- For the 45-54 age group, “Yoga” had the highest average calorie burn
- For the 55+ age group, “Cardio” had the highest average calorie burn

The data revealed that HIIT had the highest average calories burned for the majority of the younger age groups: 17-24, 25-34, and 35-44 years old. However, this trend did not hold for older members, as the highest average calories burned for the 45-54 age group was from Yoga, and for the 55+ age group, it was Cardio.

These observations demonstrated that the type of workout with the highest calorie-burning potential could vary significantly across different age demographics. While HIIT was the most effective workout type for the younger age groups, it was not the most effective for all age groups.

## Gender

To understand if the overall patterns in the data held true for both genders, I conducted a side-by-side comparison of the highest average calories burned for females, males, and the grand total within each age group. This allowed me to pinpoint any gender-specific differences in workout effectiveness.

Highest to Lowest Average Calories Burned per Age Group and Gender

Age Group	Female	Male	Grand Total
17-24	Cardio (938.769230) Strength (909.65) Yoga (884.8235294)	HIIT (1110.368421) Strength (1024.666667) Yoga (942.7)	HIIT (983.4186047) Strength (964.1315789) Cardio (932.3617021)

	HIIT (882.9166667)	Cardio (924.4285714)	Yoga (916.1081081)
25-34	Yoga (971.04) HIIT (954.5) Strength (857.7931034) Cardio (837.0571429)	Strength (1059.02941) HIIT (975.4230769) Cardio (969.0357143) Yoga (934.037037)	HIIT (967.452381) Strength (966.3968254) Yoga (951.8269231) Cardio (895.7142857)
35-44	Yoga (898.233333) HIIT (884.1428571) Strength (876.666666) Cardio (842.5217391)	HIIT (978.1333333) Cardio (972.7058824) Yoga (926.6774194) Strength(908.78125)	HIIT (939.4313725) Cardio (920.1754386) Yoga (912.6885246) Strength (894.0847458)
45-54	Yoga (845.538461) Strength (841.812) HIIT (822.289473) Cardio (753.259259)	HIIT (946.0357143) Yoga (934.2222222) Strength (917.5882353) Cardio (851.060606)	Yoga (897.0322581) Strength (880.8484848) HIIT (874.7878788) Cardio (807.05)
55+	HIIT (851.125) Strength (832.2666667) Cardio (784.2) Yoga (710)	Cardio (974.1538462) HIIT (838.818181) Strength (827.588235) Yoga (815.8421053)	Cardio (872.3928571) HIIT (844) Strength (829.78125) Yoga (784.481481)

The overall data for the highest average calories burned indicate that workouts, such as HIIT and Strength training, were the most effective. I tallied the rankings (1st, 2nd, 3rd, or 4th place) for each workout type across all age groups, and I determined a cumulative score to identify the most consistently effective workouts. The rankings were:

1. HIIT: With a score of 8, HIIT was the top-performing workout type overall. It consistently ranked first in three out of five age groups.
2. Strength: With a score of 13, Strength was the second most effective workout overall. It placed second in three age groups.
3. Cardio: With a score of 14, Cardio was the third most effective workout. It ranked first in the 55+ age group but was less effective in the younger demographics.
4. Yoga: With a score of 15, Yoga was the least effective workout type overall. It ranked first in one age group (45-54) but placed fourth in two others.

However, a side-by-side comparison of male and female results revealed significant differences that a general summary could obscure.

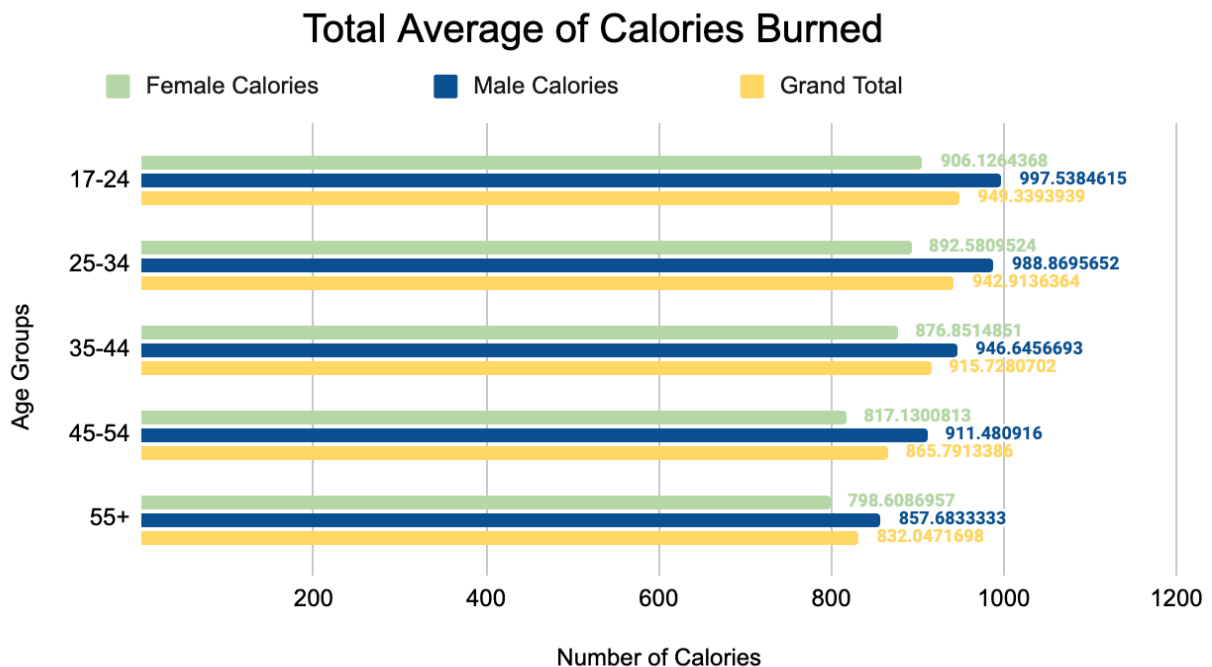
- Males: The results closely mirrored those of the overall population. The ranking of workout effectiveness from highest to lowest calorie burn was HIIT, Strength, Cardio, and Yoga. This indicated that high-intensity workouts are consistently the most effective for male members across all age groups.
- Females: In contrast, the female data showed a distinct pattern. Yoga emerged as the top calorie-burning workout, outperforming all other categories. HIIT and Strength training were tied for second, followed by Cardio. This suggests that for female members, a one-size-fits-all approach based on overall trends may not be the most effective strategy.

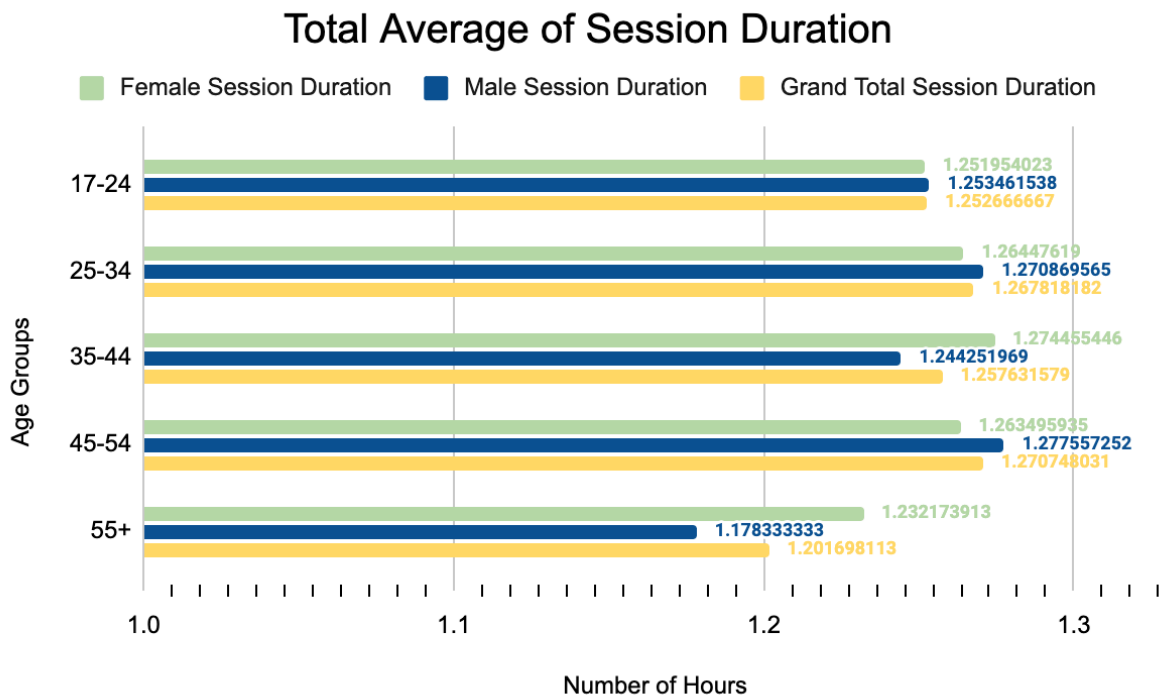
## Total Averages

The Pivot table provided a Total Average row, which represented the overall average for each demographic group (e.g., a total average for all females in the 17-24 age group). It was the average of the average calories burned or session duration (hours) for all workout types within a specific age and gender group. This number aided in a quick comparison of different demographic groups against each other using a single metric. Their “total average” could be compared to see which group, on the whole, has a higher calorie burn regardless of the specific workout type they do. Using these numbers, I created a chart and corresponding graphs to display the raw data and any trends observed.

Total Averages

Age Group	Female Calories Burned	Female Session Duration	Male Calories Burned	Male Session Duration	Grand Total Calories Burned	Grand Total Session Duration
17-24	906.1264368	1.251954023	997.5384615	1.253461538	949.3393939	1.252666667
25-34	892.5809524	1.26447619	988.8695652	1.270869565	942.9136364	1.267818182
35-44	876.8514851	1.274455446	946.6456693	1.244251969	915.7280702	1.257631579
45-54	817.1300813	1.263495935	911.480916	1.277557252	865.7913386	1.270748031
55+	798.6086957	1.232173913	857.6833333	1.178333333	832.0471698	1.201698113





The data revealed a clear inverse relationship between age and average calories burned for the overall population, a trend that was consistent for both male and female members. The average calories burned peaked in the youngest age group (17-24) and progressively decreased with each subsequent age group.

However, this pattern was not mirrored in session duration. The overall average session duration was longest for the 45-54 age group and shortest for the 55+ age group. When analyzed by gender, males followed this trend, while females had their longest sessions in the 35-44 age group. One consistent finding was that the 55+ age group, across both genders, consistently recorded the shortest session durations.

For the visualization:

To effectively compare the two metrics, which were on different scales, I created two separate charts. To better illustrate the subtle differences and trends in session duration, I adjusted the x-axis to begin at 1 hour instead of zero. The calories burned x-axis was adjusted to start at 100 to provide a more comparable visual representation of the trends across both metrics.

These results suggested that as we age, we expend fewer calories, regardless of the duration of the session. A direct comparison of the data reveals a clear negative correlation between age and average calories burned. This pattern was consistent for both males and females. In contrast, no similar trend was observed for session duration, highlighting a discrepancy in which changes in workout length did not mitigate the decrease in caloric output.

[Share](#)

The question was: **"Are there specific workout types that are associated with higher calorie burn and session duration for certain age groups, and does this relationship vary by gender?"**

The analysis of member workout data revealed a clear and consistent inverse relationship between age and average calories burned, a trend that was present across both male and female members. While the youngest members (17-24) exhibited the highest caloric expenditure, this metric steadily decreased with each subsequent age group, regardless of the overall session duration. However, a deeper dive into the data highlighted that the most effective workouts for calorie expenditure and session duration were not consistent across the entire population. For the overall population, four of the five age groups showed a perfect overlap between the workout type that yielded the highest average calorie burn and the one with the longest average session duration. However, the 25-34 age group was a notable outlier, with HIIT (High-Intensity Interval Training) leading in calorie burn, while Strength had the longest session duration. A gender-specific analysis further illuminated these distinctions. For females, a consistent pattern emerged, with Yoga being the top performer for both calories burned and session duration across multiple age groups. The 55+ age group was an exception, with HIIT generating the highest calories burned, while Strength sessions were the longest. Similarly, for males, a substantial overlap existed across the age groups, with the 45-54 age group being the exception, where HIIT was the top calorie-burning activity and Yoga sessions were the longest. There was no overlap of the highest calorie burn and longest session duration for females and males across the entire population.

The data demonstrates that a one-size-fits-all approach is insufficient for optimizing member outcomes and, by extension, member retention.

#### Act

Based on these findings, I recommend the following data-driven strategies for the Evolve Wellness management team to create more effective and personalized gym programs.

- **Tailor Programs:** Shift from a generalized approach to creating personalized programs that cater to the specific needs of different age and gender groups. The data indicate that HIIT is most effective for younger members, while Cardio and Yoga are more effective for older members and females, respectively.
- **Highlight High-Ranking Workouts:**
  - For Females: Promote Yoga as a primary offering, as the data indicates it is a top performer for both calorie burn and session duration across multiple age groups.
  - For Males and younger members: Promote HIIT and Strength training, as these workouts consistently rank as the highest calorie-burners and longest session durations for these groups.
- **Collect data or conduct surveys:** Determine when members use the gym and their preferred potential class times, allowing for better tailoring of class times to specific populations and genders.
- **Educate Members:** Although the data reveal specific population and gender preferences, educate members on the profits of certain workout types, regardless of age or gender. Females may benefit from Strength training, while males may benefit from Yoga. Additionally, incorporating Cardio at a lower intensity or Yoga for all ages is essential to

balance and aid in recovery from the repetitive HIIT sessions, which are more taxing on the body.