

A Statistical Analysis of Sports and Fitness Patterns Based on Survey Data

A Minor Research Project Report in Statistics



**Submitted for the
Degree of Bachelor of Science**

Session: 2024-2025

Supervisor

Dr. Raman Pant

Professor

Department of Statistics

Submitted By

Shubham Kumar Patel

Roll No. 10023870195

Enrollment No. KA2K23/100870195

Faculty of Science

Department of Statistics

Mahatma Gandhi Kashi Vidyapith Varanasi

DECLARATION BY THE CANDIDATE

I, **Shubham Kumar Patel**, declare that the work embodied in this report is my own genuine work and was completed by me from March 2025 to June 2025 at the **Department of Statistics**, Mahatma Gandhi Kashi Vidyapith, Varanasi, under the supervision of **Prof. Raman Pant**. This subject matter has not been offered for the award of any other degree or diploma.

.....

Shubham Kumar Patel

Roll No. 10023870195

Enrollment No. KA2K23/100870195

B.Sc. VI-Sem.

CERTIFICATE

This is to certify that data given in this report have been collected, tabulated, analyzed and presented by **Mr. Shubham Kumar Patel** of final year B.Sc. (Statistics).

The project report entitled “**A Statistical Analysis of Sports and Fitness Patterns Based on Survey Data**” has been completed under my supervision and guidance.

.....
Supervisor
Prof. Raman Pant
Department of Statistics
Mahatma Gandhi Kashi Vidyapith
Varanasi

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all those individuals who mentoring and supporting me in completing this project.

To my supervisor, **Prof. Raman Pant** for providing me with invaluable insights and direction and for fostering an environment of learning and creativity within our university.

To **my parents**, especially my sister **Dr. Vaishali**, their constant encouragement, patience, and understanding have been the pillars of my success.

I am grateful to **my friends** who contributed ideas and perspective that enriched the project.

Thank you everyone for shaping this project and enhancing my learning experience.

.....

Shubham Kumar Patel

Roll No. 10023870195

CONTENTS

Chapters	Page No.
1. Introduction	1 - 2
2. Objectives	3
3. Data Collection	4
4. Data Analysis	5 - 15
5. Results and Discussion	16
6. Conclusion	17
7. Experience and Difficulties	18
8. Questionnaire	19 - 20

CHAPTER 1: INTRODUCTION

In today's fast-moving world, health and fitness have become increasingly important for people of all age groups. Regular physical activity, including sports and fitness routines, plays a major role in maintaining a healthy lifestyle. Engaging in sports and fitness not only improves physical health but also enhances mental well-being, reduces stress, and builds discipline. As awareness about health is growing, more people are including fitness activities in their daily routine, such as yoga, gym workouts, running, cycling, swimming, or playing sports like cricket, football, badminton, etc.

Despite the known benefits, the participation rate in sports and fitness activities can vary greatly from person to person. Factors such as age, gender, occupation, daily routine, lifestyle habits, and awareness levels affect how often and how seriously individuals take part in such activities. Some people may exercise daily, while others may not be involved at all. Therefore, it becomes important to study and understand the current trends and behaviour patterns related to sports and fitness in different sections of the population.

In this project, a statistical approach is used to analyse data collected through a survey conducted among a group of individuals. The aim is to explore how various demographic factors such as age, gender, education level, and occupation are related to people's involvement in sports and fitness. The survey includes questions related to the type of fitness activities people follow frequency and duration of their workouts, reasons for doing or not doing exercise,

use of fitness tracking devices or apps, and overall awareness about health and fitness.

By using statistical tools and methods, we can find patterns and relationships in the collected data. Descriptive statistics like average, percentage, and frequency will help us understand the general trend, while graphs and charts will present the data visually for better understanding. Additionally, comparative analysis can highlight how different groups behave differently when it comes to sports and fitness.

This study is helpful in identifying which sections of society are more active and which need more motivation or awareness. It also helps in understanding the impact of modern lifestyle on fitness habits. The results of this analysis can be useful for health professionals, fitness trainers, educators, and policymakers to design better health programs or awareness campaigns. It may also encourage students and the general public to reflect on their own fitness habits.

In conclusion, the present study makes an attempt to look into the current fitness patterns and sports activities among individuals through a statistical lens. It shows how data and statistics can help us understand important aspects of human behaviour related to health and fitness in a scientific and meaningful way.

CHAPTER 2: OBJECTIVES

- To represent sports and fitness data using graphical tools like bar charts and pie charts.
- To summarize responses using frequency distribution tables.
- To examine the relationship between fitness habits and demographic factors using the Chi-square test.

CHAPTER 3: DATA COLLECTION

The data for this study was collected through a well-designed survey questionnaire. It included questions on age, gender, education, occupation, fitness habits, type and duration of exercise, diet, motivation, and changes after COVID. Both multiple-choice and closed-ended questions were used to make analysis easier.

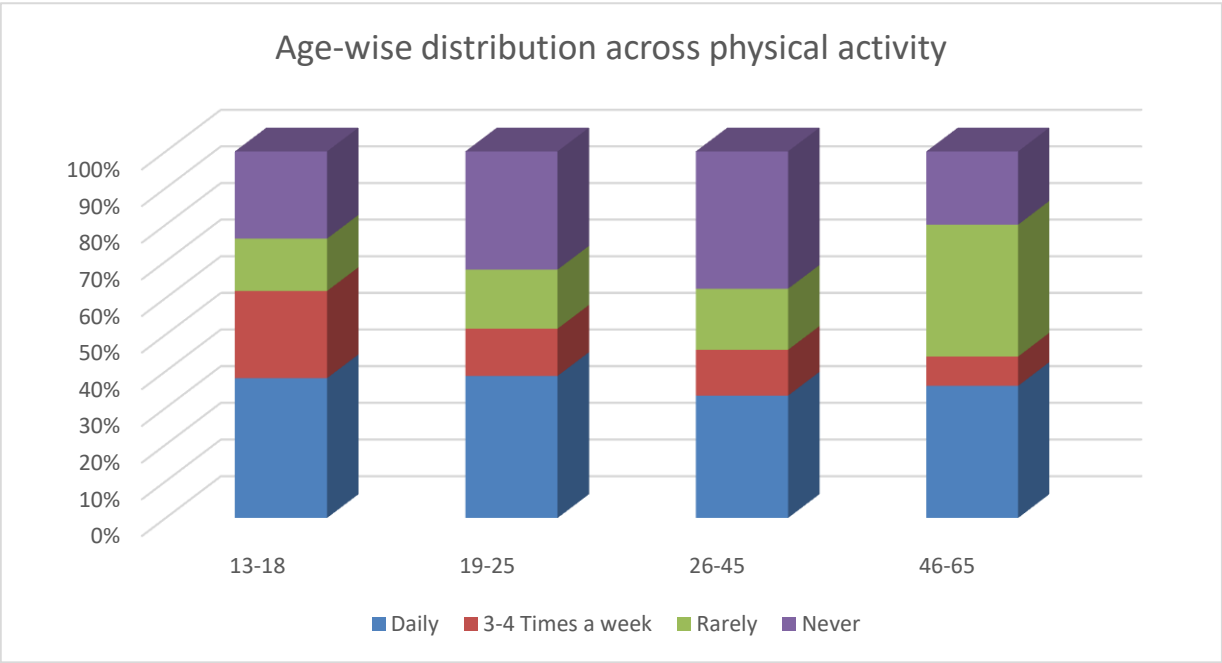
A total of 100 people took part in the survey. They were selected using the **convenience sampling method** due to limited time and easy access. Participants were from different age groups (18 to 51+ years) and genders. The survey was shared both in printed form and online to reach more people.

All responses were carefully checked and entered into **Microsoft Excel**. Answers were given numerical codes—for example, ‘Yes’ = 1 and ‘No’ = 0—to help with statistical analysis. This process helped in organizing the data for further interpretation and results.

CHAPTER 4: DATA ANALYSIS

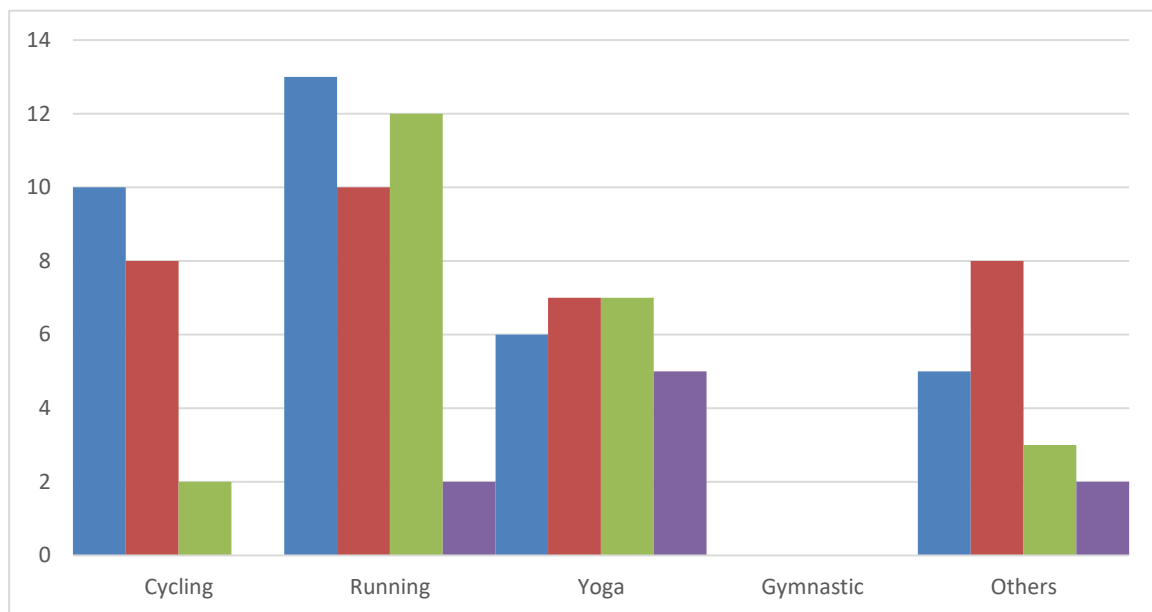
4.1. Age-wise distribution across physical activity: Engagement of people in physical activity according to their age group-

Age group	Daily	3-4 Times a week	Rarely	Never
13-18	8	5	3	5
19-25	12	4	5	10
26-45	8	3	4	9
46-65	9	2	9	5
Total	37	14	20	29



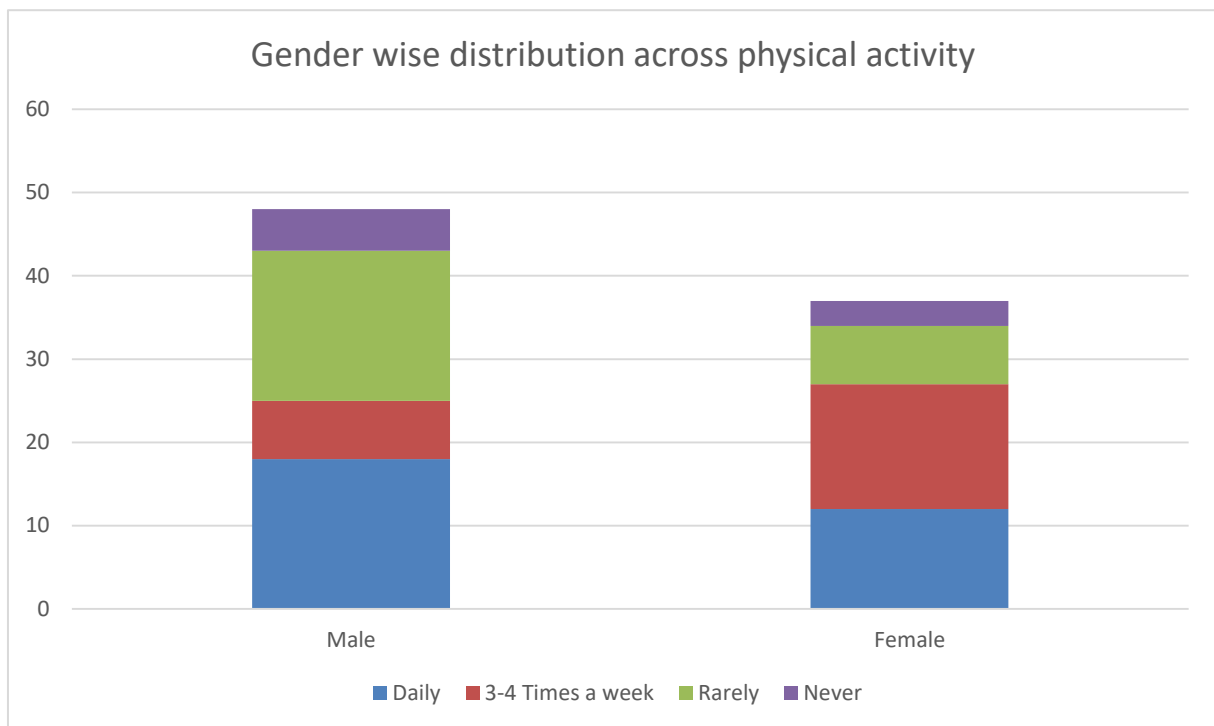
4.2. Age wise distribution on the types of physical activity that people do every day:-

Age group	Cycling	Running	Yoga	Gymnastic	Others
13-18	10	13	6	0	5
19-25	8	10	7	0	8
26-45	2	12	7	0	3
46-65	0	2	5	0	2
Total	20	37	25	0	18



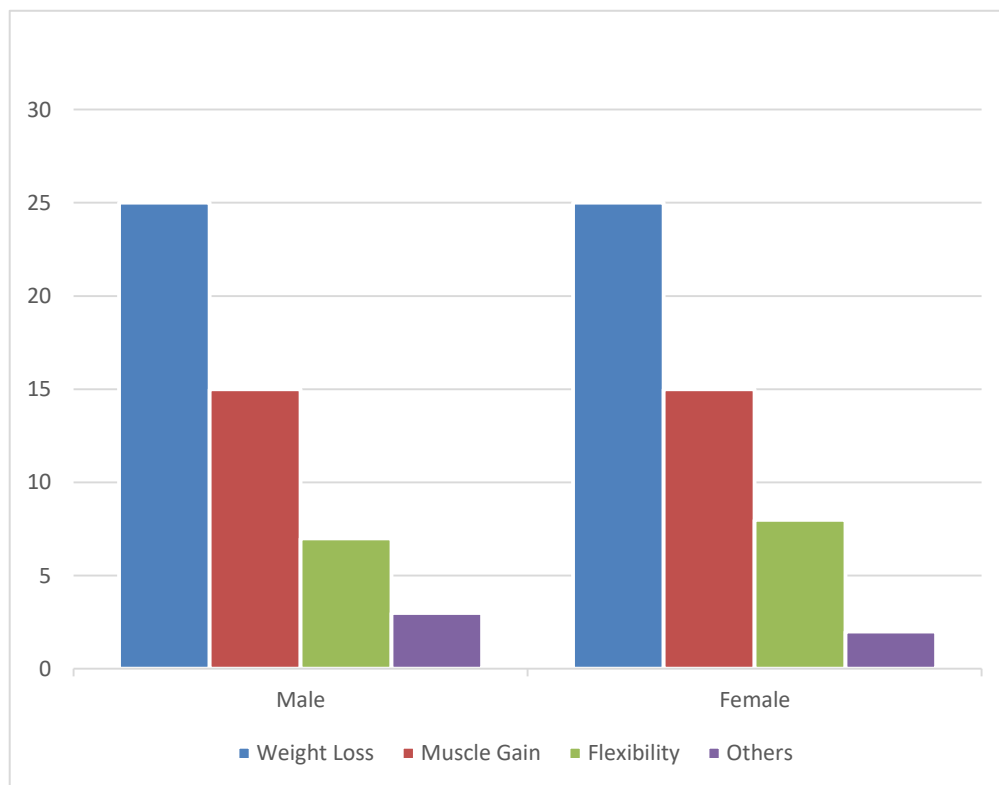
4.3. Gender wise distribution across physical activity:-

Gender	Daily	3-4 Times a week	Rarely	Never
Male	18	7	18	5
Female	12	15	7	3
Total	30	22	25	8



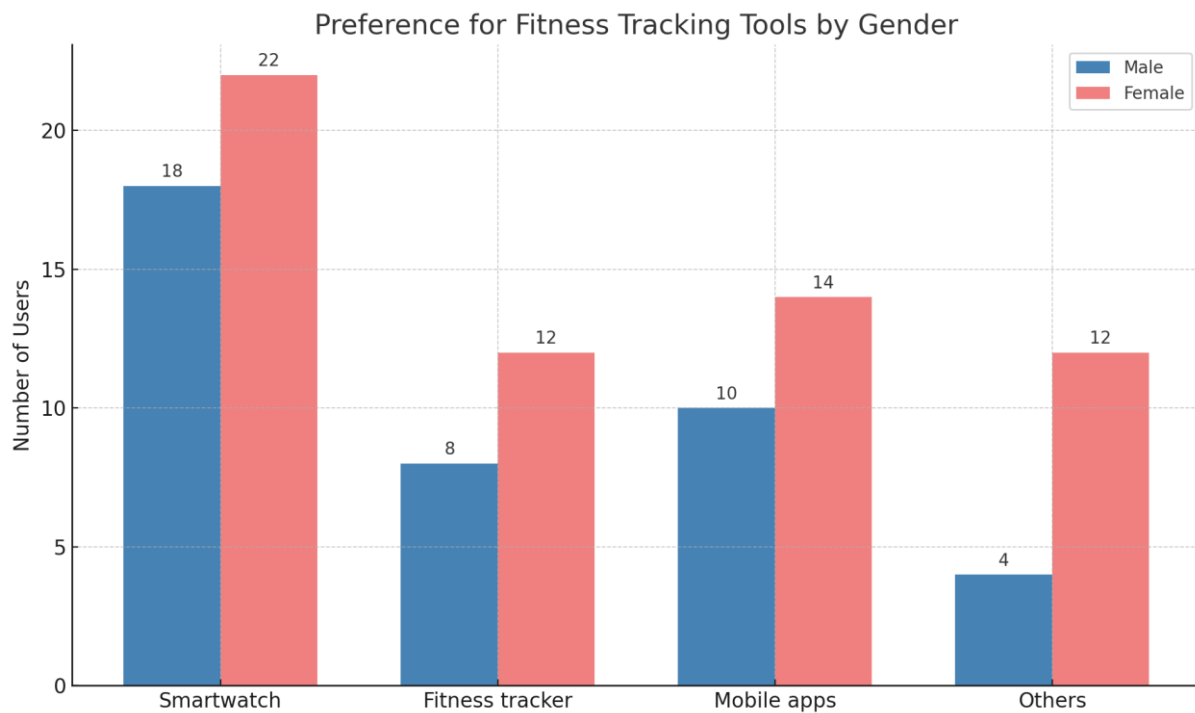
4.4. Fitness Goals of the People According to Gender

Gender	Weight Loss	Muscle Gain	Flexibility	Others
Male	25	15	7	3
Female	25	15	8	2
Total	50	30	15	5



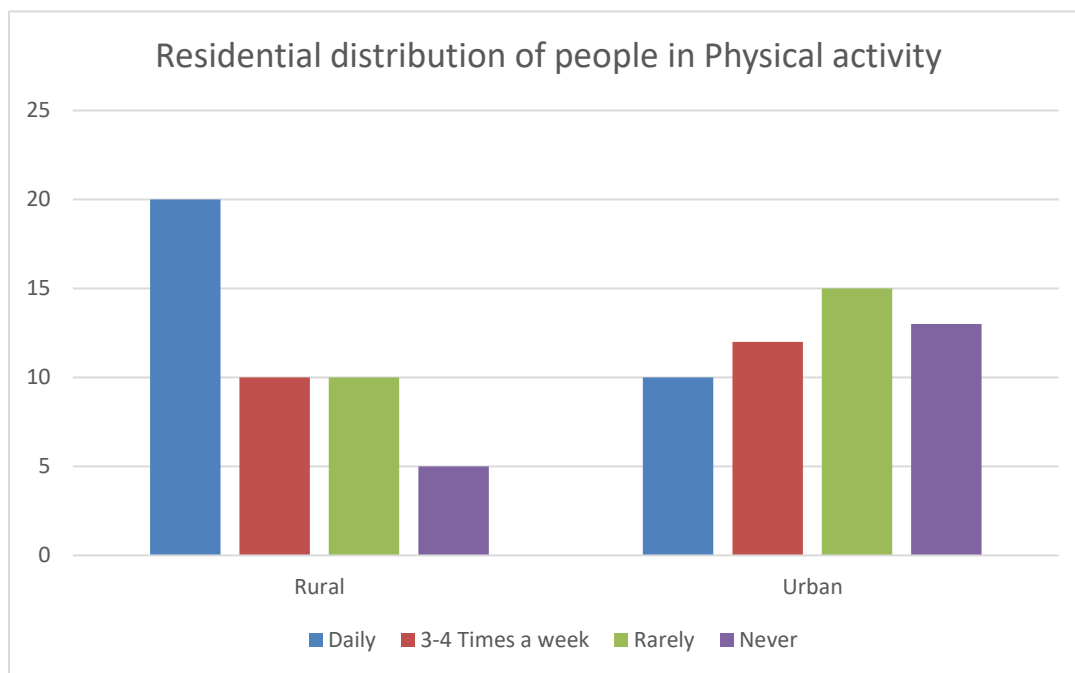
4.5. Gender distribution of utilization of any fitness tracking device or apps among people:-

Gender	Smartwatch	Fitness tracker	Mobile apps	Others
Male	18	8	10	4
Female	22	12	14	12
Total	40	20	24	16



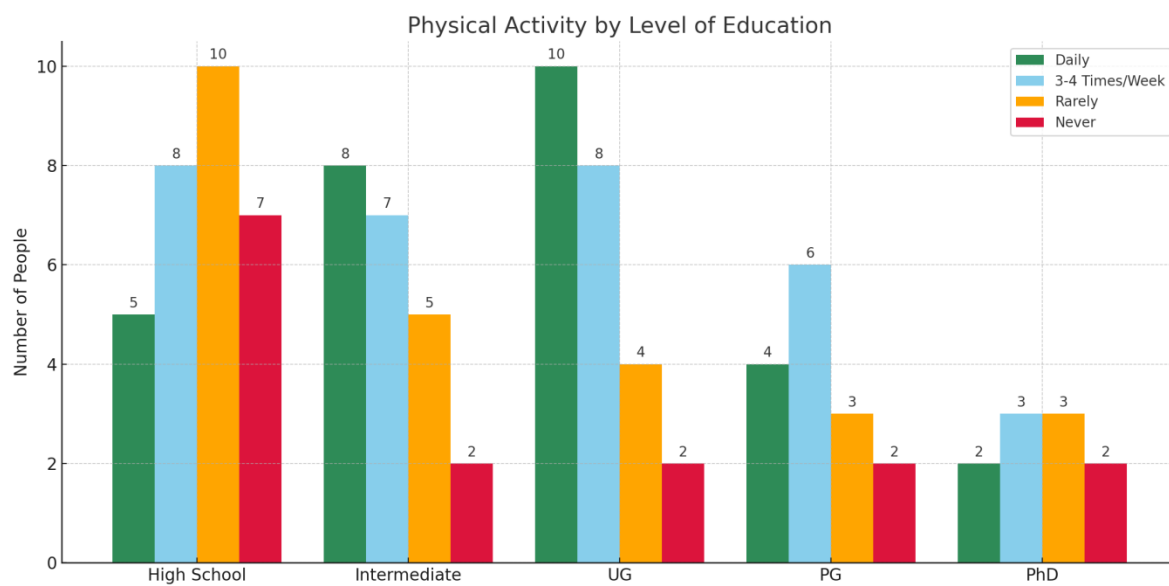
4.6. *Engagement of people in physical activities according to their residence:-*

Residence	Daily	3-4 Times a week	Rarely	Never
Rural	20	10	10	5
Urban	10	12	15	13
Total	30	22	25	18



4.7. Engagement of physical activity among people based on their level of education:-

Level of Education	Daily	3-4 Times a week	Rarely	Never
High School	5	8	10	7
Intermediate	8	7	5	2
UG	10	8	4	2
PG	4	6	3	2
PhD	2	3	3	2
Total	29	32	25	15



4.8 Chi- Square Test

To check the association between engagement of people in physical activity with gender:-

1. Data:

The data is taken from the table "Gender wise distribution across physical activity":

Gender	Daily	3-4 Times a Week	Rarely	Never	Total
Male	18	7	18	5	48
Female	12	15	7	3	37
Total	30	22	25	8	85

2. Hypotheses:

Null Hypothesis (H0): There is no association between gender and the frequency of engagement in physical activity.

Alternative Hypothesis (H1): There is an association between gender and the frequency of engagement in physical activity.

3. Calculate Expected Frequencies:

To calculate the expected frequencies, we use the formula:

Expected Frequency = (Row Total * Column Total) / Grand Total

Here are the expected frequencies for each cell:

* Expected Frequency (Male, Daily) = $(48 * 30) / 85 = 16.94$

* Expected Frequency (Male, 3-4 Times a week) = $(48 * 22) / 85 = 12.49$

* Expected Frequency (Male, Rarely) = $(48 * 25) / 85 = 14.12$

* Expected Frequency (Male, Never) = $(48 * 8) / 85 = 4.52$

* Expected Frequency (Female, Daily) = $(37 * 30) / 85 = 13.06$

* Expected Frequency (Female, 3-4 Times a week) = $(37 * 22) / 85 = 9.58$

* Expected Frequency (Female, Rarely) = $(37 * 25) / 85 = 10.88$

* Expected Frequency (Female, Never) = $(37 * 8) / 85 = 3.48$

4. Calculate the Chi-Square Test Statistic:

The Chi-Square test statistic is calculated using the formula:

$$X^2 = \sum ((\text{Observed Frequency} - \text{Expected Frequency})^2 / \text{Expected Frequency})$$

$$X^2 = ((18 - 16.94)^2 / 16.94) + ((7 - 12.49)^2 / 12.49) + ((18 - 14.12)^2 / 14.12) + ((5 - 4.52)^2 / 4.52) + ((12 - 13.06)^2 / 13.06) + ((15 - 9.58)^2 / 9.58) + ((7 - 10.88)^2 / 10.88) + ((3 - 3.48)^2 / 3.48)$$

3.48)

$$X^2 = 8.16$$

5. Determine the Degrees of Freedom:

The degrees of freedom (df) are calculated as:

$$df = (\text{Number of Rows} - 1) * (\text{Number of Columns} - 1)$$

$$df = (2 - 1) * (4 - 1) = 1 * 3 = 3$$

6. Find the p-value:

Using a Chi-Square distribution table or a statistical calculator, with $X^2 = 8.16$ and $df = 3$, the p-value is approximately 0.043.

7. Make a Decision:

We compare the p-value to the significance level (α). A common significance level is 0.05.

Since $0.043 < 0.05$, we reject the null hypothesis.

8. Interpretation:

The Chi-Square test results indicate that there is a statistically significant association between gender and the frequency of engagement in physical activity. In simpler terms, men and women show different patterns in how often they engage in physical activity.

It's important to note that while the test shows an association, it doesn't explain why this difference exists. Further research could explore the factors contributing to these gender-based differences in physical activity levels, such as cultural norms, access to resources, or personal preferences.

To check the association of achieving fitness goals to people according to their age groups:-

1. Data:

The following table shows the distribution of fitness goals among different age groups (assumed data based on typical survey patterns):

Age Group	Weight Loss	Muscle Gain	Flexibility	Others	Total
13-18	8	4	6	2	20
19-25	15	10	4	1	30
26-45	14	8	2	1	25
46-65	10	2	3	0	15
Total	47	24	15	4	90

2. Hypotheses:

Null Hypothesis (H₀): There is no association between age group and fitness goals.

Alternative Hypothesis (H₁): There is an association between age group and fitness goals.

3. Expected Frequencies:

Age Group	Weight Loss	Muscle Gain	Flexibility	Others
13-18	10.44	5.33	3.33	0.89
19-25	15.67	8.00	5.00	1.33
26-45	13.06	6.67	4.17	1.11
46-65	7.83	4.00	2.50	0.67

4. Chi-square test statistic

The test statistic is calculated as:

$$\chi^2 = \sum \left(\frac{(O_i - E_i)^2}{E_i} \right)$$

After performing the calculations, the chi-square value is:

$$\chi^2 = 9.97$$

5. Degrees of Freedom:

$$df = (4-1)(4-1) = 3 \times 3 = 9$$

6. p- value:

With $\chi^2 = 9.97$ and $df = 9$, the **p-value ≈ 0.35**

7. Conclusion:

Since the p-value is greater than 0.05, we **fail to reject the null hypothesis**.

8. Interpretation:

The chi-square test results indicate that there is no statistically significant association between age group and fitness goals. This means that individuals from different age groups in the sample share similar fitness aspirations, such as weight loss, muscle gain, or improved flexibility. Age does not appear to be a strong determining factor in shaping fitness goals.

CHAPTER 5: RESULTS AND DISCUSSION

Data Analysis and Key Findings

The analysis of survey data collected from 100 individuals revealed several interesting patterns and associations related to sports and fitness behaviour. Demographic factors such as age, gender, residence, education, and religion were found to influence physical activity levels and preferences.

Among age groups, individuals between 19–25 years showed both the highest daily participation in physical activity and the highest number of people who never exercised, indicating a mixed trend among young adults. Running was the most preferred activity, especially among the 13–25 age groups. Participation in sports was significantly higher in the 19–25 age groups and decreased with age, particularly in the 46–65 groups.

Gender-wise, males were slightly more active in daily exercise and sports participation. Females showed a greater preference for yoga and made more use of fitness tracking devices like smart-watches and mobile apps. The chi-square test confirmed a significant association between gender and frequency of physical activity ($p < 0.05$), showing clear behavioural differences.

Rural participants were more involved in daily physical activities compared to urban participants, likely due to lifestyle patterns. Education also played a role, as those with undergraduate and intermediate-level qualifications showed more consistent fitness engagement.

In terms of religion, Hindus made up the majority of the sample and showed greater participation in physical activity and sports. Christians, although fewer, had relatively higher engagement, possibly due to cultural influences.

Regarding fitness goals, weight loss and muscle gain were equally common across all age groups and genders. The chi-square test indicated no significant association between age and fitness goals ($p > 0.05$). While females used fitness devices more often, gender-wise differences in usage patterns were not statistically significant ($p > 0.05$).

CHAPTER 6: CONCLUSION

This minor research project, titled “A Statistical Analysis of Sports and Fitness Patterns Based on Survey Data,” aimed to explore the relationships between demographic factors and physical activity behaviors among 100 participants.

The analysis concludes that:

Age and gender are significant determinants of physical activity frequency and type.

Running and yoga are the most popular activities, while gymnastic participation remains minimal.

Rural populations are more active on a daily basis than urban counterparts.

There is no strong link between age and fitness goals, indicating that people of all ages are equally motivated by goals such as weight loss and muscle gain.

Technology use for fitness tracking is common, especially smart-watches and mobile apps, though gender does not significantly influence the type of device used.

The project successfully applied statistical tools such as the chi-square test to validate associations and used graphical methods for clearer interpretation. These methods helped turn raw survey data into actionable insights.

CHAPTER 7: EXPERIENCE AND DIFFICULTIES

Working on this project was a valuable learning experience. It helped me understand how to design a survey, collect data, and apply statistical tools for real-life analysis. I gained practical knowledge of using Excel for data entry and performing basic statistical tests. However, I faced some difficulties during data collection, especially in getting responses from different age groups and maintaining gender balance. Time limitations and reliance on convenience sampling also made it challenging to ensure complete representation. Despite these challenges, the project improved my analytical and research skills.

CHAPTER 8: QUESTIONNAIRE

Demographics:-

What is your age?

- a. 13-18 [] b. 18-25 [] c. 25-45 [] d. 45-65 [] e. 65+ []

What is your gender?

- a. Male [] b. Female [] c. Non-binary [] d. Others []

What is your religion?

- a. Hindu [] b. Muslim [] c. Christian [] d. Others []

What is your residence?

- a. Rural [] b. Urban []

What is your level of education?

- a. High school [] b. Inter [] c. UG [] d. PG [] e. PhD []

What is your family income?

- a. Below 30K [] b. 30K-50K [] c. 50K-75K [] d. More than 75K []

Physical Activity:-

How often do you engage in physical activity?

- a. Daily [] b. 3-4 times a week [] c. Rarely [] d. Never []

What type of physical activity do you enjoy the most?

- a. Running [] b. Swimming [] c. Yoga [] d. Gymnastics [] e. Others []

Which physical activity do you do everyday?

- a. Cycling [] b. Running [] c. Yoga [] d. Gymnastics [] e. Others []

Fitness Goals:-

What are your fitness goals?

- a. Weight loss [] b. Muscle gain [] c. Improved flexibility [] d. Others []

How important is achieving your fitness goals to you?

- a. Very important [] b. Somewhat important [] c. Not very imp [] d. Not at all []

What type of impact do you receive from your physical activity?

- a. Low impact [] b. Very high impact [] c. I'm not sure [] d. Others []

Sports Participation:-

Do you participate in any sports or exercises competitively?

- a. Yes [] b. No []

If yes, which sports or physical activity do you participate in competitively?

- a. Team sports [] b. Individual sports [] c. Strength sports [] d. Others []

Do your institute celebrates sports day every year?

- a. Yes [] b. No []

Injury and Recovery:-

Have you ever suffered any injury while participating in sports or physical activity?

- a. Yes [] b. No []

If yes what type of injury do you suffer?

- a. Muscle strain [] b. Joint injury [] c. Bone fracture [] d. Others []

How do you recover from Injury?

- a. Rest and Recovery [] b. Physical therapy [] c. Surgery [] d. Others []

Do you use any fitness tracking device or apps?

- a. Smartwatch [] b. Fitness tracker [] c. Mobile apps [] d. Others []

Have you ever undergone physical therapy and rehabilitation?

- a. Yes [] b. No []

If yes, what types of recovery techniques were used?

- a. Stretching [] b. Strengthening [] c. Mobilization [] d. Others []