B. Tech Project Report

On

Exercising in Pollution

(Submitted in Partial Fulfillment for the B.Tech

Second Year Core Course on Human Geography and Societal Needs

(HS202)

By

Group 50

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April 2022

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Abstract

With approximately 2.5 million lives claimed, pollution continues to be one of the biggest threats to human beings. Recent trends are not very encouraging as cities like Delhi and Ghaziabad are seeing a continuous upward trend in pollution. This concerning trend makes the analysis of the factors that lead to these deaths of paramount importance. Studying the different facets of the causes of these deaths, we can implement preventive measures and make the physical activities safer. In our project we have studied data related and suggested a prototype to prevent premature deaths.

Since proposing an effective solution takes hours of research and focus, in this project report we will focus on finding innovative technological solutions and policy changes to curb the harms caused by doing physical activities in unsuitable climatic conditions or polluted environments.

We will discuss at length how these problems pose a potent threat to your health, the methodology adopted to identify the problem as well as understanding all the aspects of it. After convincingly portraying the threat and issues related to these causes— we will dive deep into the different interventions, technological and otherwise, that can be implemented to bring about a change in a positive direction.

Introduction

Problem Statement

Exercising can reduce your risk of major illnesses, such as coronary heart disease, stroke, type 2 diabetes and cancer and lower your risk of early death by up to 30%. This statement makes exercise look like a benefactor but there's something else you are unaware of. Exercising in a healthy environment is a benefactor whereas it is more of an antagonist when done in a polluted habitat. Our project mainly focuses on enlightening people about their health status, what pollution is doing to them, and the consequences of exercising in unhealthy surroundings. It will lead you to a healthy lifestyle by telling you where, when and what to do in order to stay fit and avoid diseases.

Identification

Health sector is a major sector with a lot of loopholes and chances of improvement. What makes it crucial is that it affects us directly. If we find a gap, it must be resolved as soon as we can. When we started looking for a gap, this sector attracted us the most and pollution was the major antagonist. After researching this sector we reached our problem statement.

Methodology

In order to proceed with our project and the prototype, it was important to understand the level of awareness and physical activity of people around us. What people think about exercise and its threats was our major concern. To study all of it, we conducted a survey using the google forms which included questions related to health awareness and our problem statement. Social networking platforms like Whatsapp, Gmail and Linkedin were mainly involved in increasing the reach of the form.

The survey form covered people from different places over India, from different age groups, with different physical activities and medical conditions. People involved in this survey belong to different localities with different atmospheric conditions, which gave our study a strong basis.

Data Analysis

● What kind of physical activity are you involved in?

For this question we gave several options like walking, running, indoor sports etc.

What kind of physical activity you are actively involved in?

102 responses
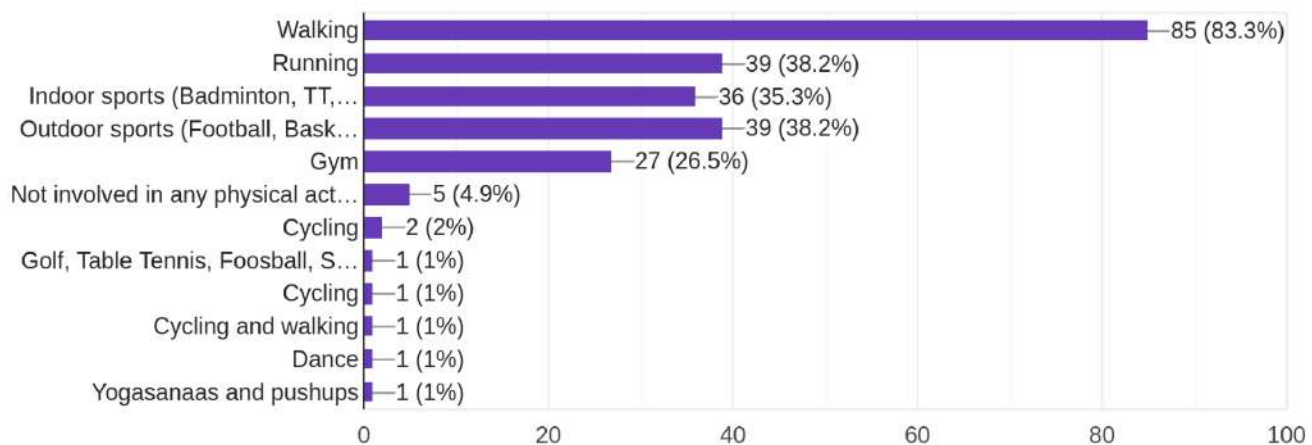
Fig 1: Bar Graph depicting physical activities people prefer

Around **83.3 %** people are involved in walking, which is the maximum. **38.2 %** people are involved in running, another **38.2 %** in outdoor activities. While **35.3 %** people are involved in indoor activities, **27 %** people are involved in gym. These are the major physical activities preferred by people. There is a proportion of people who are not involved in any physical activities, that is around **4.9 %**.

● Rate your knowledge about the effects of exercise (part of the body it affects /how it affects) that you do?

Rate your knowledge about the affects of exercises (part of the body it affects/how they affects) that you do?

102 responses
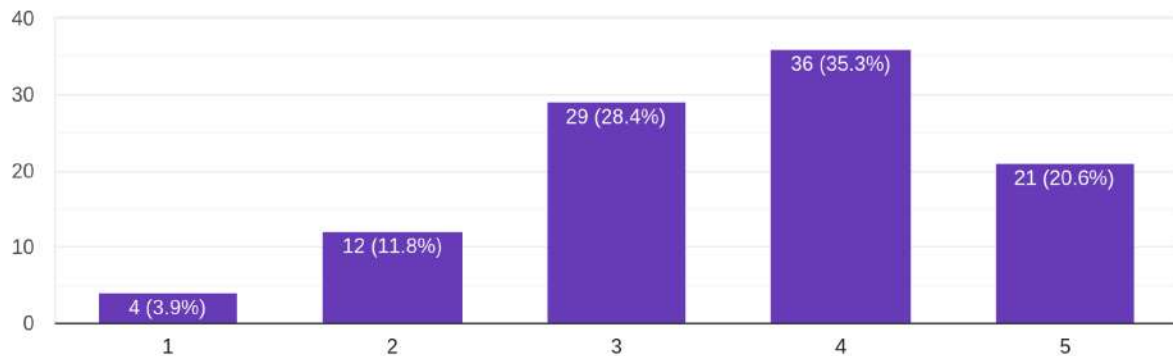
Fig 2: Bar Graph depicting people's knowledge about physical activities

This data showed that only **20.6 %** of people were confident enough to say that their knowledge is at 5 on a 1-5 scale. Majority (**35.3 %**) voted for a 4, while **3.9 %** of people could only choose 1.

● Have you ever thought that exercising in a polluted environment may cause more harm than benefits?

Fig 3: Pie Chart showing what people think about the problem statement

This question was added to judge the level of awareness among people. Only **57.8 %** of people were aware of this possibility while **15.7 %** of people had no idea about it.

- Do you think you want some device that can tell you what the surrounding conditions (amount of pollution/temp./humidity) are, and accordingly will guide you about the preferred physical activities?
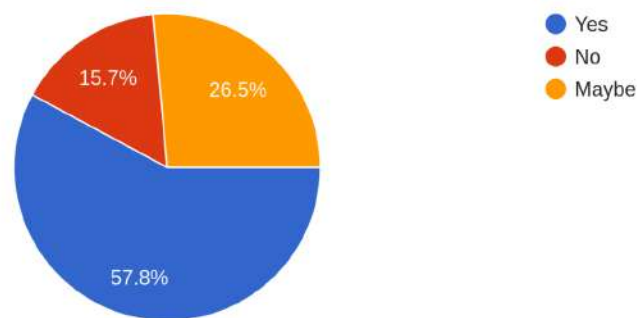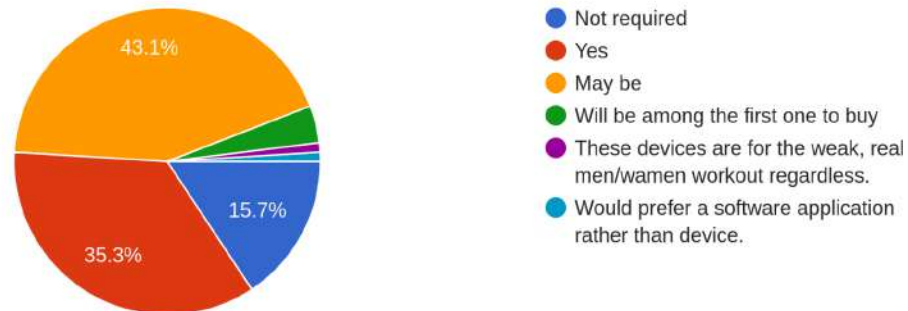

Fig 4: Pie Chart showing what people think about the prototype

35.3 % of people voted for yes, while **43.1 %** of people said maybe. This signifies that there is a gap. There is a need for a device which can guide people about the climatic conditions and the pollution stats.

Description

According to a study by WHO, insufficiently active people have a 20% to 30% increased risk of death compared to those who are sufficiently active. WHO also says that more than 80% of the world's adolescent population is insufficiently physically active and if you are reading this, there is a 0.128 chance that you are one of these. The reason for this data is lack of awareness among the population about the benefits of exercising and being involved in some physical activity.

Regular physical activity is proven to help prevent and manage non-communicable diseases such as heart disease, stroke, diabetes and several cancers. It also helps prevent hypertension, maintain healthy body weight, and improve mental health. Not only does regular exercise help you reduce your risk of developing diseases and manage your weight, but it can also help prevent and treat mental health problems.

Nowadays, we move around less and burn off less energy than people used to. Research suggests that many adults spend more than 7 hours a day sitting down, at work, on transport, or in their leisure time. Technology can be beneficial when used efficiently, in this project we aim at doing the same. We plan to introduce a technology which can track the pollution and climatic conditions of one's surroundings and suggest physical activities which can be done in order to stay healthy.

Current Developments

- Smartwatches

Fig 5: Smart Watch

- Fit bands

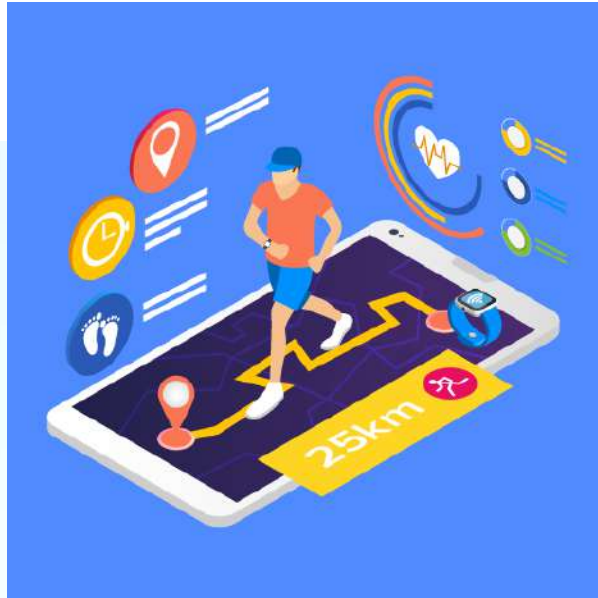**Fig 6: Fit Band**

- Tracking Applications

Fig 7: Representation of a Tracking Application

All of these devices tell you about your fitness status, your activeness level, sleep cycle etc. It is done through motion sensors and location trackers by counting the calories burnt or the steps walked. Although, no device tracks the pollution level and other climatic conditions. The prototype presented by us will track both of them and then will suggest exercises accordingly.

Significance

According to a study, at least 30.7 % of deaths in India can be attributed to air pollution from fossil fuels, that means about 2.5 million people die every year after breathing toxic air. Not to mention the other harmful effects of pollution like greenhouse effect, global warming, acid rains, forest fires, etc. Pollution causes a huge loss to life and property and is increasing day by day at an alarming rate.

It can be avoided by adapting a healthy lifestyle, i.e., by eating healthy and by getting involved in some sort of physical activities in a pollution-free surrounding. We have gone so busy with our work that we don't have enough time to focus on our health, we just keep going and doing anything which seems right to us with the basic knowledge we have. To get the best output, there must exist some device which can do the research for us and suggest the best. Our prototype is one such device.

Objectives

- **Awareness**

  Our project mainly deals in creating awareness about the toxic effects of exercising in a polluted atmosphere. As mentioned above, in our survey output we found that a huge proportion of the population is ignorant and they must be informed about all of it.

- **Health hazards**

  Heart diseases, lung cancer, cholera, hepatitis, etc are all caused due to pollution contributing to the number of deaths. Efficient physical activities can improve this data. It will even improve the immunity and stamina of an individual. Hence leading to a better lifestyle with less chances of health hazards.

- **Increasing productivity**

  Many people are involved in physical activities but oftenly can't get the desired output. People go to the gym in order to upgrade their physique or weight loss, they go on long walks to avoid blood pressure-related problems and being active increases their physical strength. However, not getting enough output is quite common. The leading reason for this is lack of skills and professionalism, with our prototype we will resolve this issue.

- **Increase the lifespan**

  They say health is wealth, it is something you can't buy. You can't add years to your life by earning money. You have to cherish it, maintain it and take care of yourself. According to a study the average lifespan of an Indian is 69.66 years, this number used to be greater. Earlier people lived in a relatively cleaner environment which boosted their lifespan, we can bring those days back. Our prototype will contribute in doing so.

Tools and Technology:

- **Tool/Device:** We will introduce a portable device that could measure and record the surrounding conditions such as pollution, humidity, temperature, etc., at the same time in a predecided amount and will provide it as an input data in the application calculations to give the desired suggestions.

The device will be able to detect the conditions in a parameter of around 40-50 meters and will share the data with the application via Bluetooth, internet, etc.

Fig 8: Environment sensor device

● **Technology/ Software:** We will be making an application software, which would be our leading and unique service. The customer will be putting his/her sensitive information and medical history in this application and then integrating it with the device mentioned above; this application will suggest to perform the most effective physical activities suitable for them.

We will integrate this application with different on-demand services like fitness tracking, body checkups, etc., in separate sections within the app after collaborating with that service provider.

Detailed Work plan/technological interventions:

Step 1: Data Collection and Analysis

We will start with collecting data on:

- Pollution, humidity, and temperature levels in different regions of the country to help us target the most relatable customers.

- The overall effects of these parameters on different parts of the human body.

- Preference on types of exercises for different body parts and organs.

- Different kinds of human diseases and corresponding do's don't according to body limits in those diseases.

To analyze such sensitive data, we require the assistance of different qualified Doctors and Fitness experts to verify our collected data and help with more data inputs.

Step 2: Product Development

- We will be designing an algorithm that predicts the recommendation from the database created by us. It will be a self-learning algorithm that will improve itself with the users' feedback and suggest exercises accordingly in the future. In case a scenario arises whose data doesn't match with any case in our database, then the algorithm will recommend the most probable solution and will take users' feedback and add this case to the database, thus improving itself and updating the database for the future.

- Our pollution detecting device will have an effective radius up to 50 metres. It will detect the air contamination levels, humidity, temperature, etc and it will send the details via internet or Bluetooth to the mobile application. App will compare the values with the normal values and will respond accordingly.

Step 3: Collaboration and Integration

- After finalizing our product, we will collaborate with other market players to protect our product from competitors and big players.

Hence, we will approach certain fitness tracking companies and body checkup companies for collaboration and could charge them some commission later for each customer generated for them.
We plan to keep these other services as an option to our customers and not a compulsory subscription to buy along with our core services.

- It's essential now to integrate all these services in a customer-friendly way to provide an extra edge for the customers to subscribe all the services from our app only, rather than buying them independently from different platforms.

Step 4: Marketing

- It's as important to do marketing of a product as to make a quality product. As a startup, we have to keep in mind that it's important to allocate some budget to marketing and to make sure of maximum output from that marketing. We can start with newspaper advertising and street posters.

Novelty/Innovation in our proposed product:

- Although there are already many applications and websites in the market, an individual can get the info on surrounding pollution, exercises to help different body parts, tracking of physical activities, appointments from doctors, etc. But integrating all these things at a single platform, along with personalized effective service according to each individual, has not been tried by anyone.

- Our device will not only measure different parameters in the surrounding (which is already unique) but also will provide it to the application directly with the appropriate percentage requirement of that particular parameter in our calculations.

- By collaborating with different useful service providers (like activity tracking and body check appointments), we are improving our revenue source as a commission from these providers and giving a one-stop solution to our customers by creating a cloud service integration between all these services like Apple.

Fundamental approaches in implementing intervention plans:

- **Obtaining a Patent:** The first thing we will be looking to do once we make our product is to obtain a patent for it. With this, we can ensure that our product(both the device detecting the pollution and the app) can't be copied by others.

- **Connecting to fitness and health professionals:** For our product, we will hire a health professional who will help us in creating a database for suggestive measures for various health conditions and the level of pollution. We will also hire a Fitness expert who can suggest various types of physical activities one can perform according to their requirement and level of air contamination.

- **Collaborating with Fitness tracker apps:** We will be providing our customers with an extra feature: calories burnt tractor. We plan to do this by collaborating with some other applications that are currently working in this domain. This will help our users track their calories burnt, and thus they can track their progress.

Expertise available with each student to contribute in the development of the intervention:

- Our product deals with pollution and we have Rishabh on our team who's currently doing an internship in the carbon emission domain so his experience will come in handy with us.

- We are creating an app along with our pollution tracking device. For app-making, we have the likes of Maheshwar and Vaidehi on our team. Maheshwar is currently working on a web development project and has knowledge of Html while Vaidehi is working on UI/UX development project and has basic knowledge of Java.

- For the Machine Learning Algorithm, we have Sarbjot on our team. He's currently working on an open-source ML project and has some knowledge of NLP.

- We all come from a Chemical Engineering background that can help us in studying the response of the body to different levels of air contamination and think of some more engineering solutions.

## Possible constraints and barriers to implementation, design issues:

- **Market Capturing:** The first big challenge that we will face in this aspect is we don't have enough money to spend on publicity like other big companies do. Secondly, the big companies which are currently working on similar fitness tech products can create a similar model quite fast and at a cheaper rate.

- **To find certified people for cross-checking our work:** To make our product work we have to get it checked by credible Health and Fitness professionals which will be a tough task. We require a well-experienced and certified trainer who can suggest exercises primarily not according to the weather but also according to the user's choice (maybe he's a runner, gym person, etc). Then we require a proper doctor who knows the severity of adverse effects of pollution at different levels.

- **Data Collection and Advisories according to different age groups:** We are planning to conduct multiple surveys across various places in India, which will be a tough task to perform. We will have to go on the ground to conduct the surveys or conduct them online via different platforms.
  Once the data is collected, the second difficulty would be analyzing it and then suggesting recommendations according to different age groups. We have to be extra careful with people say over 50 years and also with people with some conditions like pregnancy.

- **Testing the Product at Starting:** Once we are done with the making of our product, we have to give the first 2-3 months or more months to test, whether we are able to achieve the results which we aim at.

  First comes the accurate pollution detection and secondly whether it's suggesting the accurate results as suggested by our experts with minimum error.

Expected Outcomes:

- **Spreading Awareness:** With our product, we expect, that after using it for some time, people will become more aware of the common problems they were facing, unaware of the physical activities they were performing in a polluted

Did you ever fell lazy or tired while working or exercising on a humid or rainy day?
101 responses

- Yes quite often
- Never acknowledged it
- No, never felt like so

50.5%
18.8%
30.7%
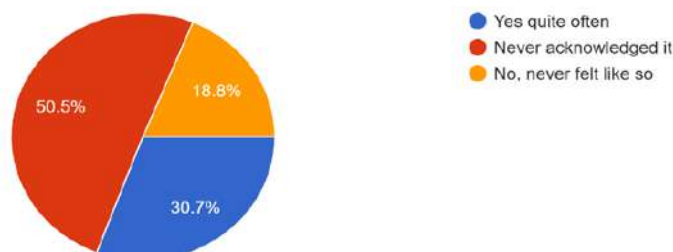
environment.

Fig 9: Pie Chart showing the number of people affected by climate while working out

Even from our survey, we, know that more than 50% of people don't acknowledge that exercising in a humid environment can feel tiring and exhausting.-

- **Better Planned Workout:** Our product will help people in planning their workouts better and prepare accordingly. For example: switching a planned running hour to a simple walk if the pollution level rises on that day and wearing light clothes, drinking more water & reducing the duration of high-intensity workouts on a hot and humid day.

- **More Optimized Workout Results:** People lose their interest in physical activities when they don't see the visual progression. Doing a high-intensity workout leads to more inlet of polluted air into our system, whose end result may not be pleasing. Thus, with our product, they can achieve their fitness goals with better precision.

- **Location Selection For Physical Activities:** Suppose someone wants to play cricket/train for a marathon/ wants to bicycle for leisure in all these cases our product can help them in choosing the location. Our product will show them the pollution and humidity levels of different locations and accordingly will suggest the type of physical activities they can perform respectively.

- **Reduction in No. of Patients Suffering from Pollution Related Conditions:** Often people suffering from diseases like asthma are prescribed to do physical exercises like walking, swimming, hiking, etc (all at low intensity). Choosing the wrong location will have an adverse effect and with our product, we can fill this gap and help in the recovery of such patients. Hence reducing the overall number of patients.

Suggested plan of action for utilization of outcome expected from the work:

- **Healthy Feedback and Grievance Management System:** Once people start buying it, we can improve its performance by making it a self-learning model. We will make an active grievance addressing system for a smooth user experience. We will listen to the users' opinions critically. If they

don't like any of our services, we will listen to them and improve accordingly.

- **Joining hand with apps booking appointments with Doctors:**
  By using our app, users will become more aware of their health status and be willing to consult a doctor for their diagnosis. We can leverage this thing by tying up with other apps that do the task of scheduling appointments with doctors. Once it gets successful, we can talk to doctors to provide free medical check-ups monthly to our active users.

- **Expanding our team size according to the Demand:** As the demand for our product increases with time, we have to hire more people to meet this demand. We will have to hire people to set up offline stores to ensure that the device detecting the pollution is working accurately. Further, we will require the team to track user data and give valuable insights. Additionally, later will need people working explicitly for marketing, bug fixing, software developers, etc.

- **Helping Government and Growing:** Collected data from users regarding their medical conditions can be helpful for the government to analyze how a particular disease is affecting the regional population and make strategies accordingly to overcome it. Secondly, for many government projects like construction work in highly polluted areas, the government can recommend our app to workers/engineers, which will benefit them and help us expand.

Conclusion:

With increasing pollution, humidity, and temperature which are coming out to be the greatest and direct threat to the health of the living beings, it's very crucial to think about the welfare of the human beings and executable action on the same. Now along with the growing awareness among people about the importance of exercising, it's also important to make them aware of the situations where these physical activities can cause more harm than the benefits.

- ❖ So to deal with these problems, we have devised a new product in the hope that this product will be able to cater to these problems along with some more handful of services. Having the image of an IITian, we are trying to contact AIIMS Delhi, Expert gym trainers, and some pollution experts from different countries to help us in our data requirement and analysis.

- ❖ Till we reach our final year we expect to receive the primary phase test data and based on the theoretical results, we will try to further improve the efficiency of the product.
- ❖ We have started working on our prototype and plan to finish our major application development part by the end of this year.
- ❖ To make this a proper profitable plan, we are in talks with our IIM alumni to help us with the product valuation, uptake funding, and collaborating strategies from different firms.

Contribution of each student

- ★ Maheshwar Pratap Singh (CTO): Data collection, Detailed description of problem, technical support.
- ★ Rishabh Garg (CEO, CMO): Detailed work plan, Survey, Product development, Integration and designing.
- ★ Sarbjot Singh (CPO): Detailed work plan, Survey, Study of research paper, product management.
- ★ Vaidehi Patidar (PR, CSO): Data collection, Detailed description of problem, technical support.

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