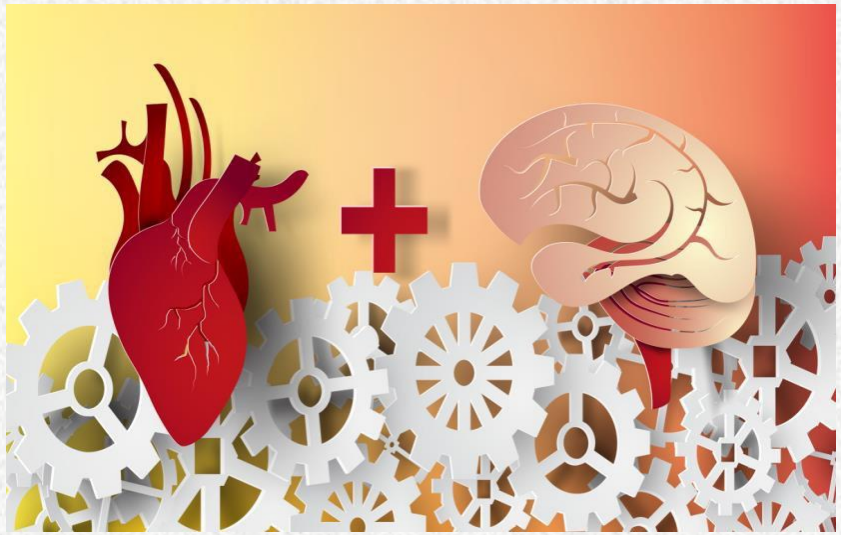
HS202 Project

GROUP-35

Human Geography and Societal Needs



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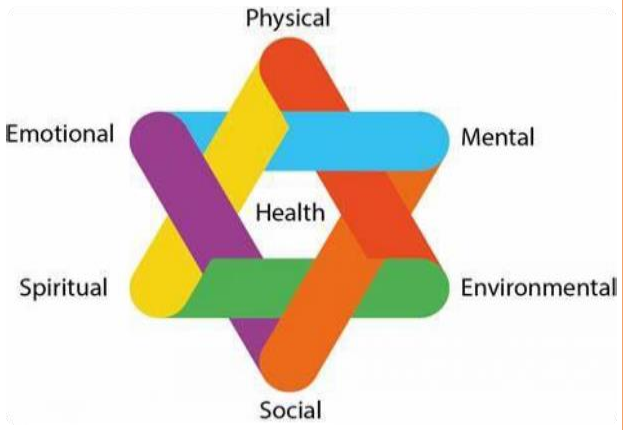

MENTAL AND PHYSICAL HEALTH TRACKER

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PHYSICAL AND MENTAL HEALTH TRACKER

ABSTRACT -

In this, we are track Mental and Physical health of a person for that we create a simple application that's installed on a mobile laptop and tab of the user. For physical health, we use body mass index. We take input like height and weight of a person and give him/her BMI. BMI give an idea of the physical health of the user. But for mental health no direct way is there, so we use a mood scale, in this we are analysing the daily activity of a person like listening to the song, which type of food people prefer when they feels tensed like tensed people generally preferred high sugar intake, and some people prefer Youtube Shorts and other streaming data apps for shorts videos , sleep cycle is also disbalanced of these people. So overall we are focusing on physical and mental state human beings. After that we have mood score using mood score formula if that mood score is more than the threshold mood score then we give a notification to the user's parents and the user's mentor, After this user's parents discuss with the user what's going on in the user's life and all other things, and also we have made rules for data privacy so that user data will always be safe.

Total Mood Score (s) : 0. 55 * v + 0. 28 * m + 0. 14 * h + 0. 3 * f

(This for calculating mood score)[1]

HEALTH

There are several types of health, each of which encompasses different aspects of an individual's well-being. Here are some of the most commonly recognized types of health:

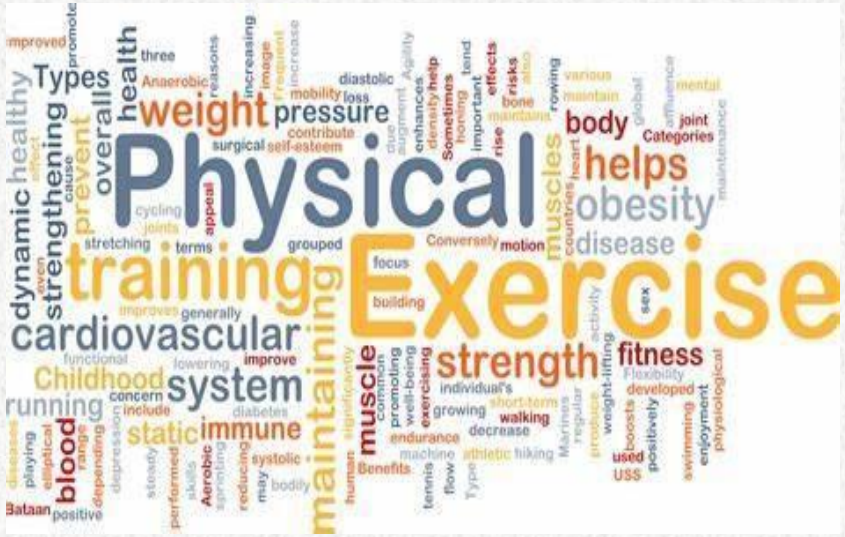
1. Physical health: This refers to the condition of the body and its ability to carry out daily activities without undue fatigue or physical stress.
2. Mental health: This refers to the psychological and emotional well-being of an individual. Good mental health allows an individual to cope with daily stressors, maintain healthy relationships, and contribute to society.
3. Social health: This refers to an individual's ability to interact with others effectively and form meaningful relationships.
4. Environmental health: This refers to the quality of the surroundings in which we live. Environmental factors such as air and water quality, sanitation, and access to green spaces can have a significant impact on our health.
5. Occupational health: This refers to the health and safety conditions of the workplace. Occupational health is essential for maintaining a healthy and productive workforce.
6. Spiritual health: This refers to an individual's sense of purpose, meaning, and connection to something greater than themselves.

Overall, these different types of health are interconnected, and an individual's well-being depends on maintaining a balance between them.

[But here we are focusing on Mental and physical health only]

PHYSICAL HEALTH

Physical health refers to the overall condition of the body and its ability to perform daily activities without undue fatigue or stress. It involves maintaining a healthy weight, engaging in regular physical activity, getting adequate sleep, and consuming a balanced diet. Good physical health is essential for a high quality of life and helps prevent chronic diseases and other health problems. It requires a holistic approach that encompasses both preventive and therapeutic measures.



Problem statement ?

Physical health is a crucial component of overall well-being, and its maintenance is essential for a fulfilling life. However, sedentary lifestyles, poor nutrition, and other lifestyle factors have led to a rise in chronic diseases such as heart disease, diabetes, and obesity, which significantly impact physical health. Moreover, the lack of access to healthcare and preventive services exacerbates these issues, particularly in underserved populations. There is a need to address these challenges and develop strategies to promote physical health and prevent chronic disease through education, policy, and community-based interventions.

How do we find which one is physically fit or not?

There are various ways to assess physical fitness and determine if an individual is physically fit or not. Here are some of the most common methods:

1. Body Mass Index (BMI): BMI is a measure of body fat based on an individual's height and weight. It provides a general indication of whether an individual is underweight, normal weight, overweight, or obese.
2. Cardiovascular fitness: This can be assessed through tests such as a treadmill test, a cycle ergometer test, or a 12-minute run/walk test. These tests measure how efficiently the heart and lungs work together during exercise.
3. Muscular endurance: This can be assessed through tests such as push-ups or sit-ups. These tests measure the ability of the muscles to sustain repeated contractions over time.
4. Flexibility: This can be assessed through tests such as the sit and reach test, which measures the range of motion of the lower back and hamstrings.
5. Strength: This can be assessed through tests such as the grip strength test or the one-repetition maximum test, which measures the maximum amount of weight an individual can lift for one repetition.

Overall, physical fitness is a multifaceted concept, and a combination of these tests can provide a comprehensive picture of an individual's physical fitness. It's important to note that physical fitness is not just about being able to perform well on these tests but also about maintaining a healthy lifestyle and engaging in regular physical activity to improve overall well-being.

[We are mainly discussing on body mass index (BMI)]

Body mass index (BMI)

Body Mass Index (BMI) is a measure of body fat based on an individual's height and weight. It provides a general indication of whether an individual is underweight, normal weight, overweight, or obese.
BMI is calculated by dividing an individual's weight in kilograms by their height in meters squared. The formula for calculating BMI is:
BMI = weight (kg) / height (m^2)
For example, an individual who weighs 70 kilograms and is 1.75 meters tall would have a BMI of:
BMI = 70 / (1.75^2) = 22.86
Based on the calculated BMI, the individual would fall into the "normal weight" category, which is typically defined as a BMI between 18.5 and 24.9.
BMI is commonly used as a screening tool to identify individuals who may be at risk of health problems related to excess body fat. However, it is important to note that BMI is not a direct measure of body fat percentage and may not accurately reflect an individual's health status. For example, athletes or individuals with a high amount of muscle mass may have a higher BMI but be perfectly healthy. Conversely, individuals with a low BMI may have a high body fat percentage and be at risk of health problems.
Overall, BMI is just one tool that can be used to assess an individual's body fat and health status. It should be used in combination with other measures, such as waist circumference and blood pressure, to provide a more comprehensive assessment of an individual's health status

By Body Mass Index we find the current status of the person.

BODY MASS INDEX

How does our application help and work?

Our application work on what data the user gives according to this our application calculates the BMI of that person and then gives a perfect diet and exercise plan. Like we take two conditions 1st BMI below 18.5 and 2nd condition BMI of more than 24.9.

BMI below 18.5

A person with a BMI less than 18.5 is considered underweight and may need to focus on both diet and exercise to gain weight and improve overall health. Here is a diet and exercise plan that can help:

Diet Plan:

1. **Increase calorie intake:** Since underweight individuals have a low BMI, they may need to consume more calories than they burn to gain weight. Aim to consume an extra 500 to 1000 calories per day.
2. **Choose nutrient-dense foods:** Focus on eating whole, nutrient-dense foods that are high in calories and protein, such as nuts, seeds, whole grains, lean meats, fish, dairy, and healthy fats.
3. **Snack frequently:** Incorporate high-calorie snacks between meals, such as fruit smoothies, trail mix, nut butter, or cheese and crackers.
4. **Drink plenty of fluids:** Aim to drink at least 8-10 cups of water per day to stay hydrated and support healthy digestion.

Exercise Plan:

1. **Resistance training:** Incorporate resistance training exercises such as weight lifting, bodyweight exercises, or resistance bands to build muscle mass and strength.

2. **Aerobic exercise:** Participate in regular aerobic exercise such as running, cycling, or swimming to improve cardiovascular health and burn calories.
3. **Rest and recovery:** Allow for proper rest and recovery time to prevent overtraining and promote muscle growth.
4. **Gradual progression:** Gradually increase the intensity and duration of exercise to avoid injury and improve fitness levels.

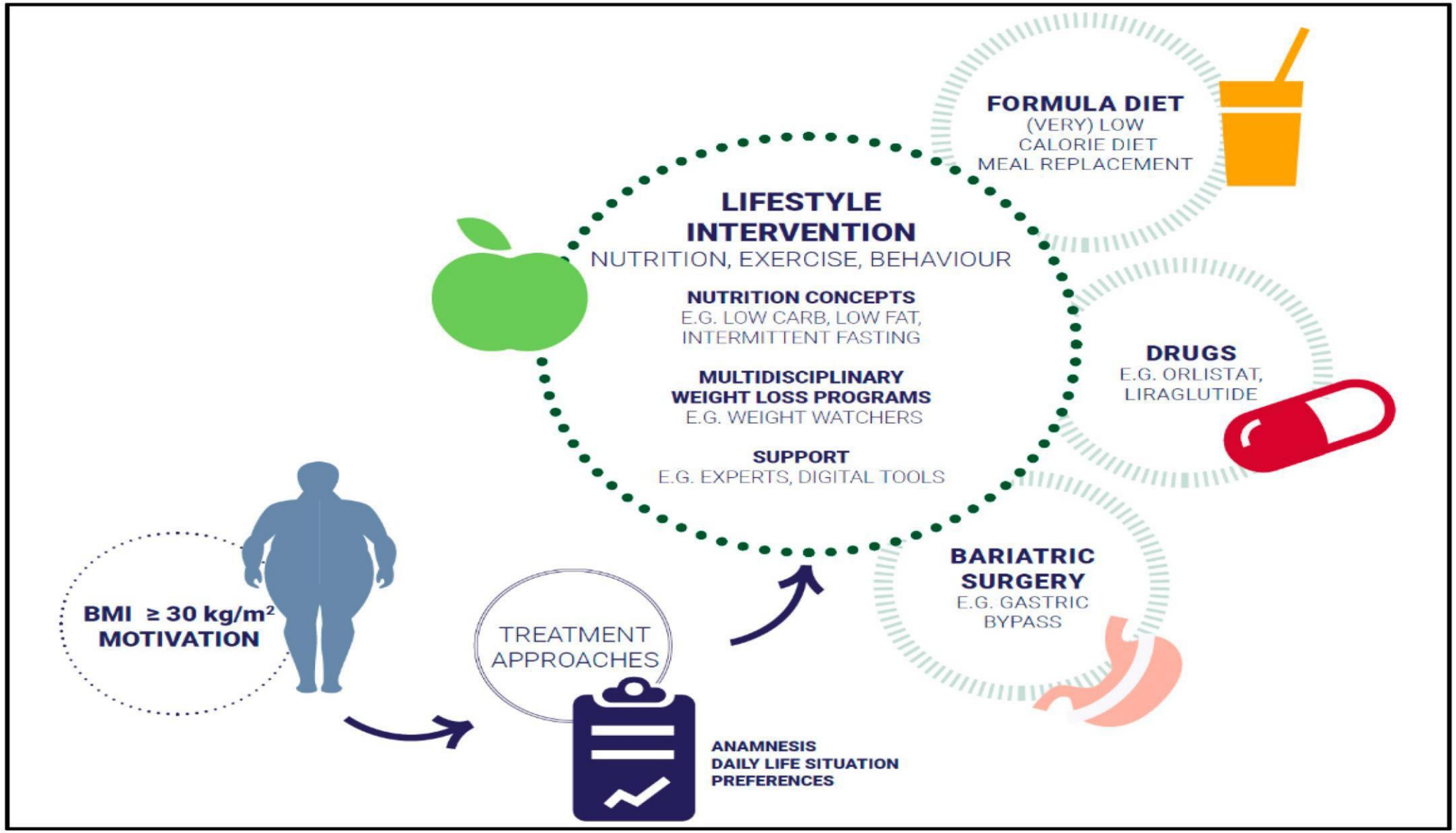
It's important to note that any significant change in diet or exercise routine should be done with the guidance of a healthcare professional, especially for individuals with underlying health conditions or medical concerns

BMI above 24.9

A person with a BMI above 24.9 is considered overweight and may need to focus on both diet and exercise to lose weight and improve overall health. Here is a diet and exercise plan that can help:

Diet Plan:

1. **Reduce calorie intake:** Since overweight individuals have a higher BMI, they may need to consume fewer calories than they burn to lose weight. Aim to reduce calorie intake by 500 to 1000 calories per day.
2. **Choose nutrient-dense foods:** Focus on eating whole, nutrient-dense foods that are low in calories and high in fiber, such as fruits, vegetables, whole grains, lean proteins, and healthy fats.
3. **Limit processed foods**: Avoid processed and high-calorie foods that are low in nutrients, such as sugary drinks, fast food, and junk food.
4. **Practice portion control:** Measure food portions and avoid overeating to reduce calorie intake.


FORMULA DIET
(VERY) LOW
CALORIE DIET
MEAL REPLACEMENT
LIFESTYLE
INTERVENTION
NUTRITION, EXERCISE, BEHAVIOUR
NUTRITION CONCEPTS
E.G. LOW CARB, LOW FAT,
INTERMITTENT FASTING
MULTIDISCIPLINARY
WEIGHT LOSS PROGRAMS
E.G. WEIGHT WATCHERS
SUPPORT
E.G. EXPERTS, DIGITAL TOOLS
DRUGS
E.G. ORLISTAT,
LIRAGLUTIDE
BARIATRIC
SURGERY
E.G. GASTRIC
BYPASS
BMI ≥ 30 kg/m²
MOTIVATION
TREATMENT
APPROACHES
ANAMNESIS
DAILY LIFE SITUATION
PREFERENCES

Exercise Plan:

1. **Cardiovascular exercise:** Participate in regular aerobic exercise such as running, cycling, or swimming to burn calories and improve cardiovascular health. Aim for at least 30 minutes of moderate-intensity exercise most days of the week.
2. **Resistance training:** Incorporate resistance training exercises such as weight lifting, bodyweight exercises, or resistance bands to build muscle mass and improve metabolism.
3. **High-intensity interval training (HIIT):** Consider incorporating HIIT workouts to boost metabolism and burn calories.
4. **Rest and recovery:** Allow for proper rest and recovery time to prevent overtraining and promote muscle growth.

It's important to note that any significant change in diet or exercise routine should be done with the guidance of a healthcare professional, especially for individuals with underlying health conditions or medical concerns. Additionally, sustained weight loss and long-term weight management may require lifestyle changes and ongoing support from a healthcare team.

Similarly, our application gives diet plans and exercise plans for other physical problems also like belly fat and other things.

- In the application we add animation they do exercises and people follow them.
- Our application also idea about how many calories you burn when you exercise.
- And it will send a notification end of the day which gives the whole analysis of the day.

Mental Health

PROBLEM STATEMENT

As obvious as it can get, mental health is crucial for our psychological, emotional and social well-being, basically having a direct impact on our everyday behaviour and lifestyle. One of the most prevalent psychiatric disorders today is major depressive disorder (MDD), or depression, which on average, affects more than 300 million people globally.

Nurturing positive mental health and nursing any signs of depriving mental health condition is pivotal to stabilising constructive emotions, behaviours, and thoughts. Nowadays, we have clear protocols for handling cases after they have been identified. However, by today's methodologies, when it's detected, it's already too late, leading us to claim that detecting mental health issues is the biggest problem.

Mental health refers to a person's overall psychological and emotional well-being. It includes managing one's feelings and behaviours, coping with stress, navigating relationships and social situations, and making decisions that promote personal growth and well-being. Good mental health is characterized by a positive sense of self, a sense of purpose, the ability to form and maintain healthy relationships, and the ability to adapt to change and cope with life's challenges. Mental health also encompasses the absence of mental health disorders and symptoms such as depression, anxiety, psychosis, and others.

Diagnosing depression can be difficult as it can manifest very differently in different people and at different times. Diagnosis may be delayed because 'symptoms' are non-specific or masked by other health problems. Mental disorders present a range of emotional and physical 'symptoms' which, when carefully explored, help reach an accurate diagnosis. Early detection is critical for rapid intervention, which can potentially reduce the escalation of the disorder

RESEARCH AND LITERATURE

1. Literature

1. Music and Mood

Mood management studies typically have shown that people select media that enhance positive moods and reduce negative moods. In this, they examined how the mood is affected by subsequent media use, mood during media consumption, and media effects on the same.(link)

With the onset of technological advancement and digitisation, access to the internet and media online have increased, resulting in people turning to the same more often as they feel low. The withdrawal/reduction from socialisation has been identified as behaviour consistent with clinical depression. This creates an emotional dependency of people on music, especially when they're low, and this doesn't always have a positive effect on their mental health.(ref)

Music and Mood

- A study conducted by IIIT Hyderabad (ref) observes the trends and patterns in people at depression risk through their music listening activity. A 13- item a questionnaire called the Healthy-Unhealthy Music Scale (HUMS) was created to evaluate musical engagement strategies that revealed maladaptive methods of using music, for example, using music to avoid interaction or turning to negative thinking and worsening after listening to music. Similar behaviour consistently found in a person is often an early sign of someone slipping into depression.

According to research (J. Stewart, S. Garrido, C. Hense, and K. McFerran, "Music used for mood regulation: self-awareness and conscious listening choices in young people with tendencies to depression," Frontiers in psychology, vol. 10, p. 1199, 2019), such musical activity does not always result in the reduction of depression symptoms. Creating intervention procedures that allow changing music listening behaviour to suit the individual's state, attributes, and general musical tastes are necessary toaddress this and perhaps provide positive results. As a result, it is crucial not only to recognise those who have depressed tendencies but also to learn about their musical preferences so that appropriate music recommendations can be made.

1.2. Mood and Food

- Another essential research by Lauren B. Marangell. and Arthur N. Westover was to study the relationship between sugar intake and depression (ref). The Food and Agricultural Organization of the United Nations provided information on sugar consumption in 1991. Using the Pearson correlation coefficient, the annual rate of major depression was associated with sugar consumption rates (cal/cap/day) for the principle analysis. There was a highly significant link between the annual rate of depression and sugar consumption for the six nations for which data were available for the primary study. Yet another study (ref) talks about the correlation between sugar intake and mood, how it affects and how people react. According to this study, there is an indication that people, in specific males, are more likely than women to experience incident mood problems when they consume sugar from sweet foods and beverages. Hence creating a cycle between sugary food consumption and mood.

1.3. Video on Demand when low?

A fascinating study was conducted by people at SAP Labs (ref) that assessed the viewer's mental health by detecting depression in youtube videos. They created and evaluated machine learning algorithms to ascertain whether YouTube videos are depressing or have a depressing trigger based on the content of YouTube videos as recorded in their transcripts.

The programme has an 83% accuracy rate for identifying depressing videos. By calculating the CES-D scores of the remarks, they provided a real-world evaluation technique to validate our categorisation based on the comments made on a movie. This activity largely complies with UN SDG 3.4 of the UN Sustainable Goal of ensuring good health and well-being.

(Reference)

1.4 Fitness, health and mood well-being

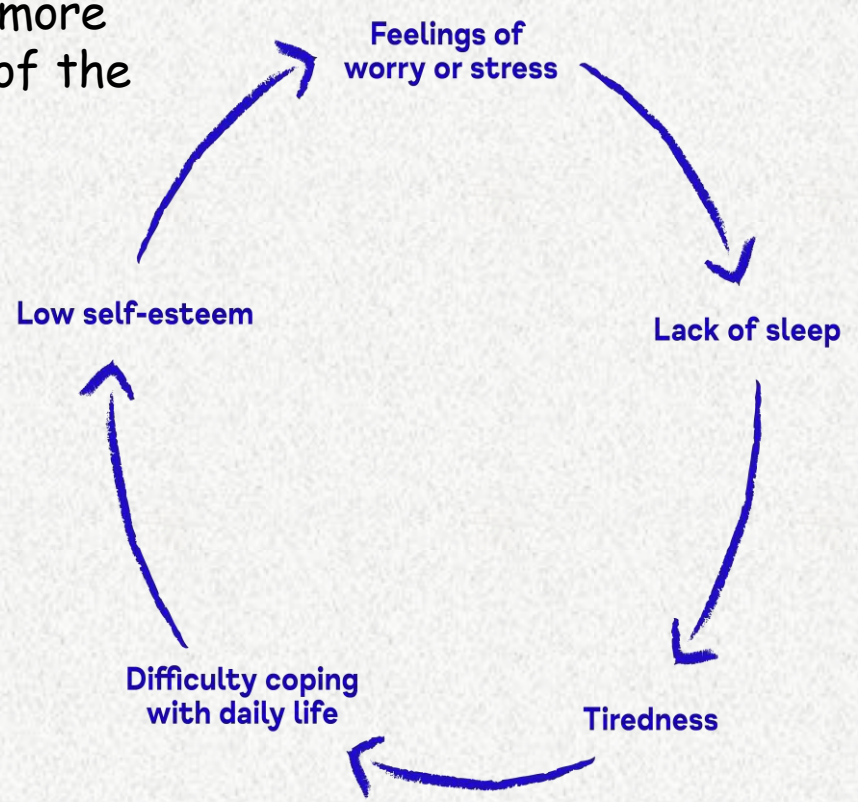
- Our mental and physical health are undoubtedly linked. Therefore our mood, whether we are feeling good or feeling low, has a significant impact on how, when and if we work out or not. It's critical to comprehend the link and pay attention to our emotions. One's mood is variable and unpredictable, and everyone reacts to exercise or performance in a slightly different way. While some individuals can't concentrate enough to get into it, others like working out harder when they're angry or annoyed. There is no doubt that one's mood influences their workout, either positively or negatively. Most people will work out better if they are in a pleasant mood. It's simpler to be inspired to work out if one feels energised, optimistic, and positive. Depression is particularly detrimental to a good workout. Apathy, loss of enjoyment in daily tasks, and exhaustion are signs of depression that make it challenging to find the drive to exercise.

There is unquestionably a link between depression and poorer performance, as demonstrated by a short study of professional athletes who had the mental disease. All of the athletes claimed that their performance suffered during depressive periods. They acknowledged that when they were down or sad, it was challenging to perform to their typical capacity.(ref)

1.5 Sleep cycle and mental health

Most people who have dealt with depression know that it frequently comes with sleep issues. It may be problematic for depressed people to fall asleep or stay asleep during the night. They may also sleep too much or become very drowsy throughout the day. Improved sleep quality and more effective depression management may result from an understanding of the complicated link between sleep and depression.

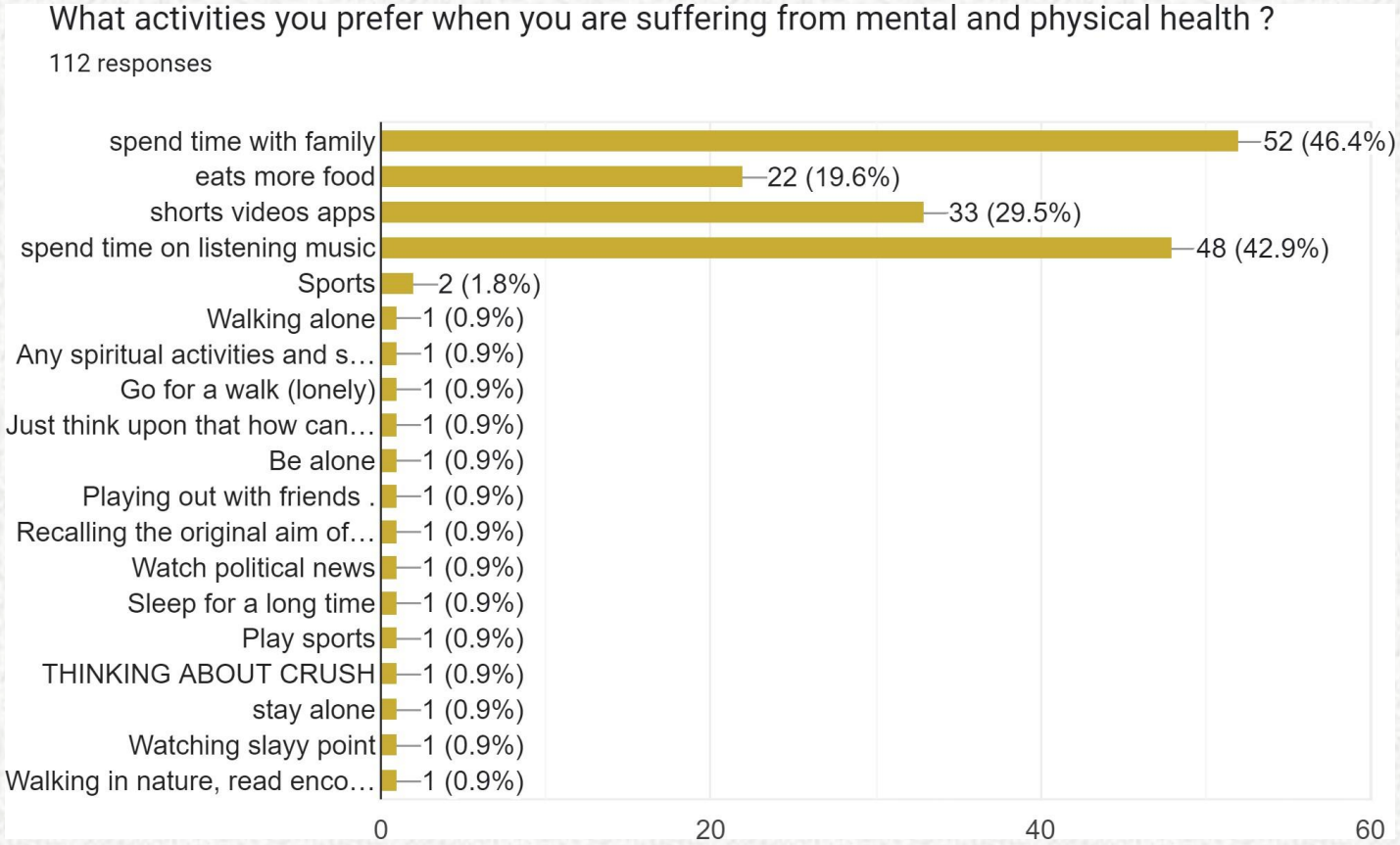
Sleep and depression are closely connected. Sleep problems are a common symptom of depression. In fact, if there are no complaints about sleep, specialists can sometimes be hesitant to identify depression. (ref) Insomnia, hypersomnia, and obstructive sleep apnea are sleep disorders connected to depression. It is believed that nearly 75% of adult patients with depression have insomnia, making it the most prevalent symptom. According to estimates, about 15% of people with depression are diagnosed with hypersomnia and 20% with obstructive sleep apnea.



2. Survey Results

We conducted a survey to verify the above-stated research and theory, which is in sync with the research papers mentioned above.

2.1 What is the most used platform when a person finds himself low ?

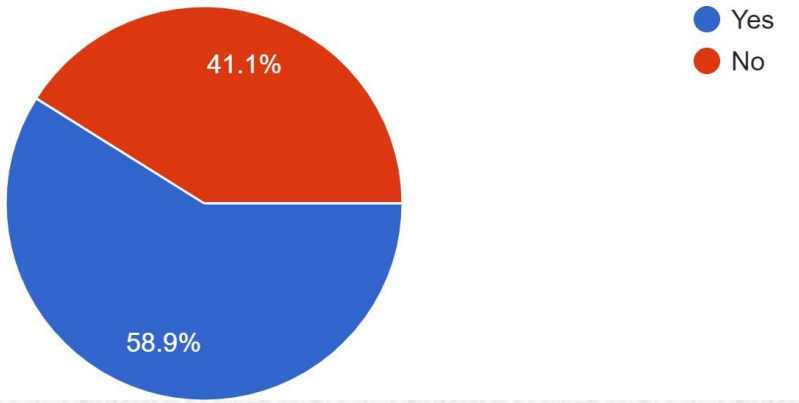


Our survey finds that most spend time with family when they feels low in mental and physical health,The next in line is music streaming, followed by shorts videos apps and after that ordering food.

It is in sync with how people resort to techniques to distract themselves while they're down, and media, video, and music streaming platforms are the most straight forward and accessible sources than anything else.

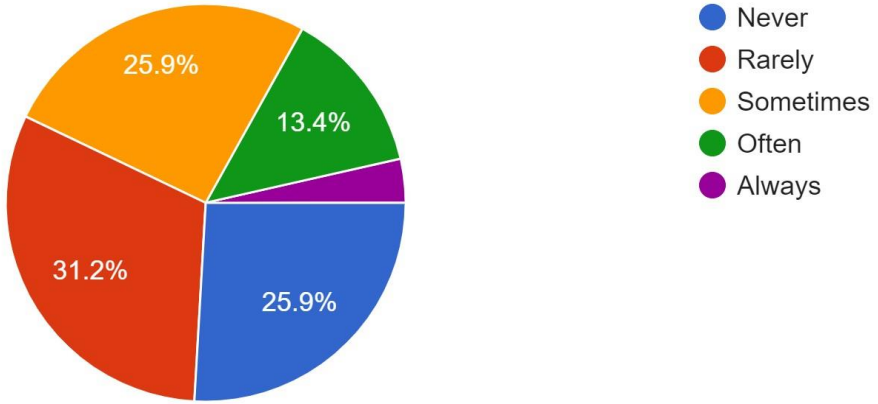
Have you experienced any significant life events or stressors recently that may have impacted your mental or physical health ?

112 responses

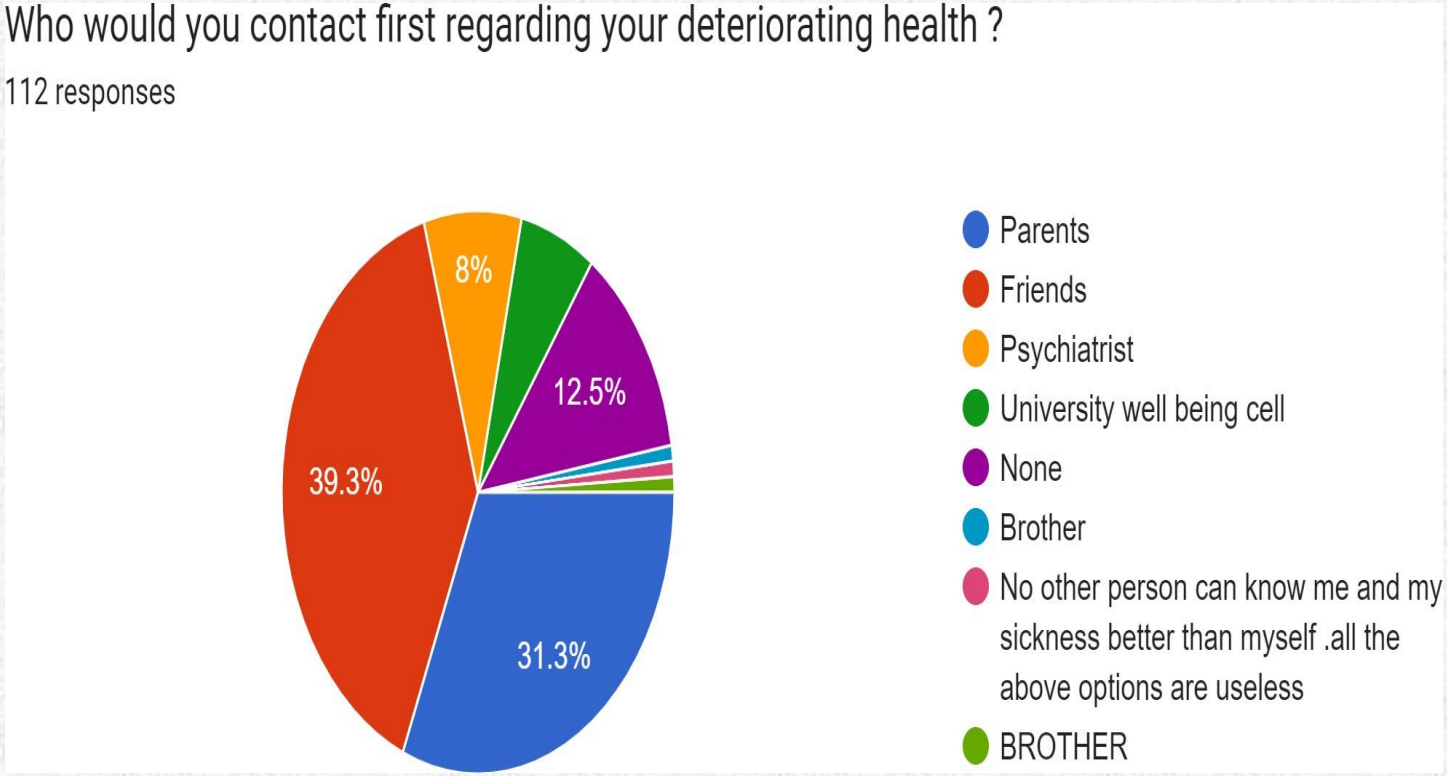


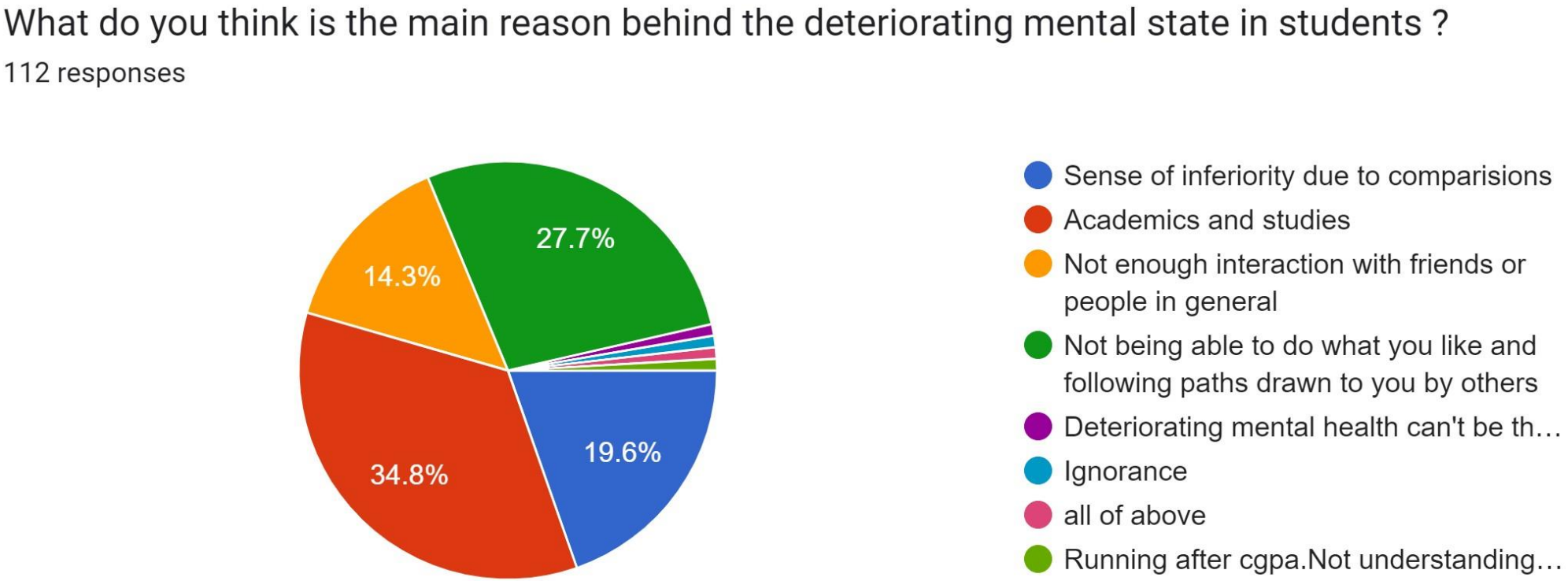
How often do you engage in relaxation techniques, such as meditation, deep breathing, or yoga ?

112 responses



- This data is helpful because when we found someone's mood score is more than the threshold mood score then we send a notification to user's parents friends and brothers and other.

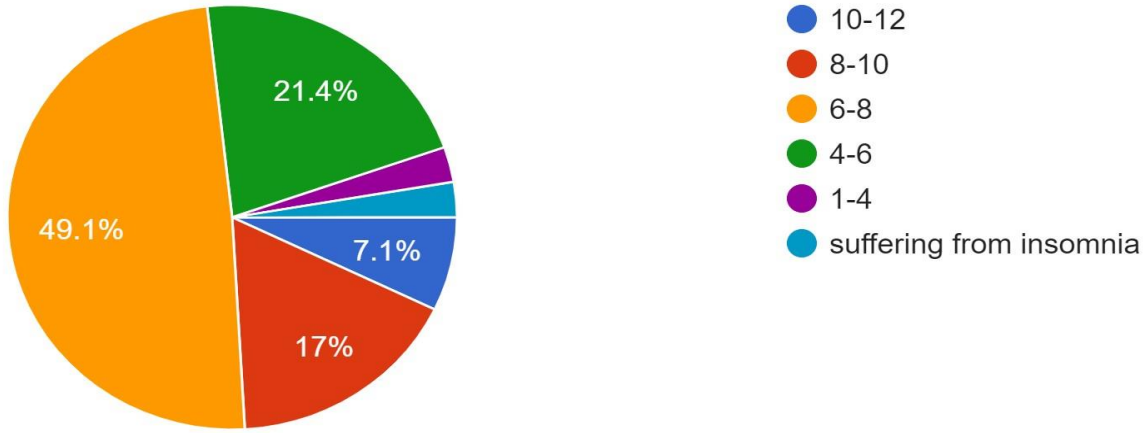




The above pie chart gives an idea about the majority reasons for mental health problems is their academics and studies pressure.
According to this, we find an area in which we launch our application.

How many hours of sleep do you typically get per night ?

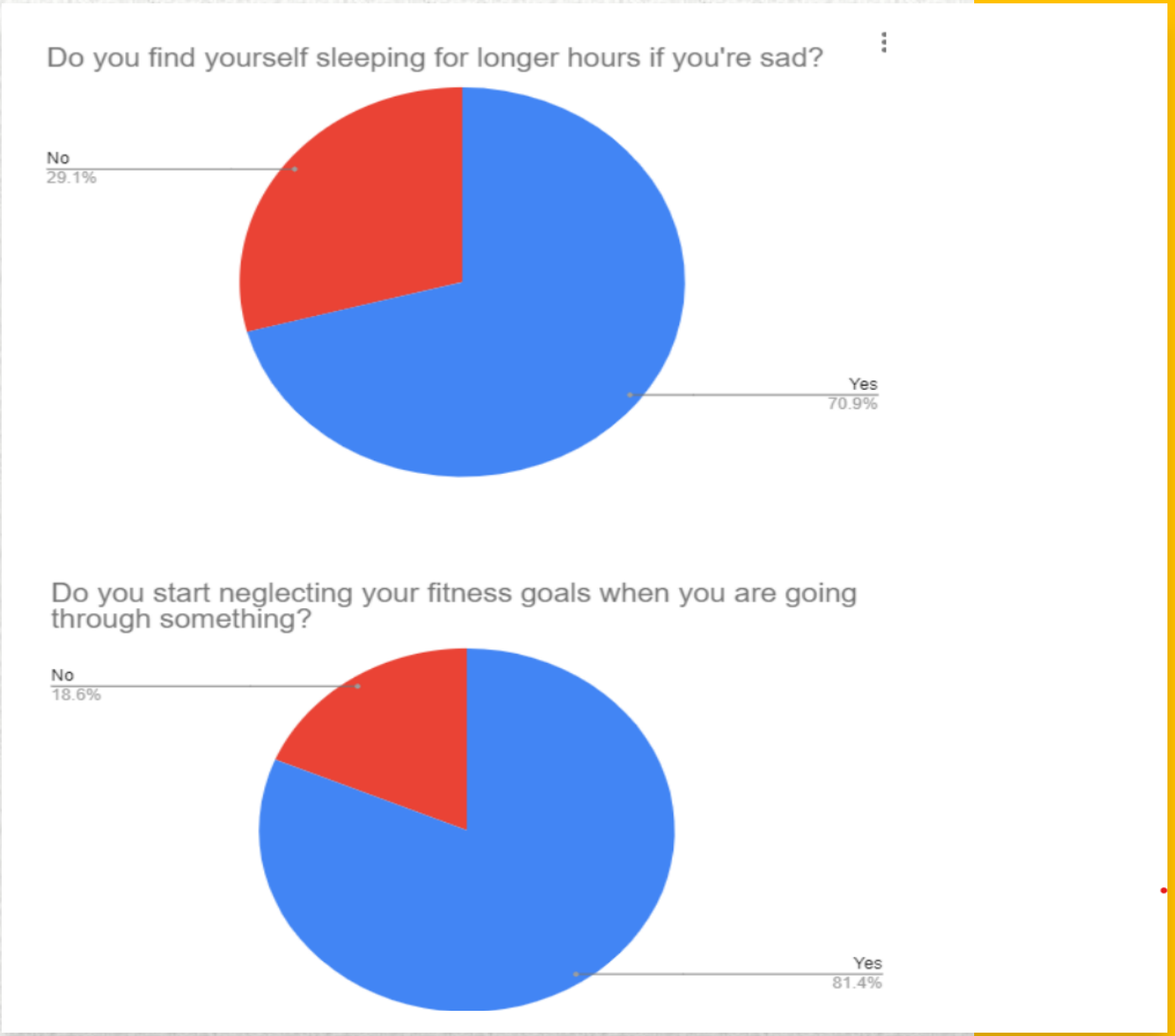
112 responses

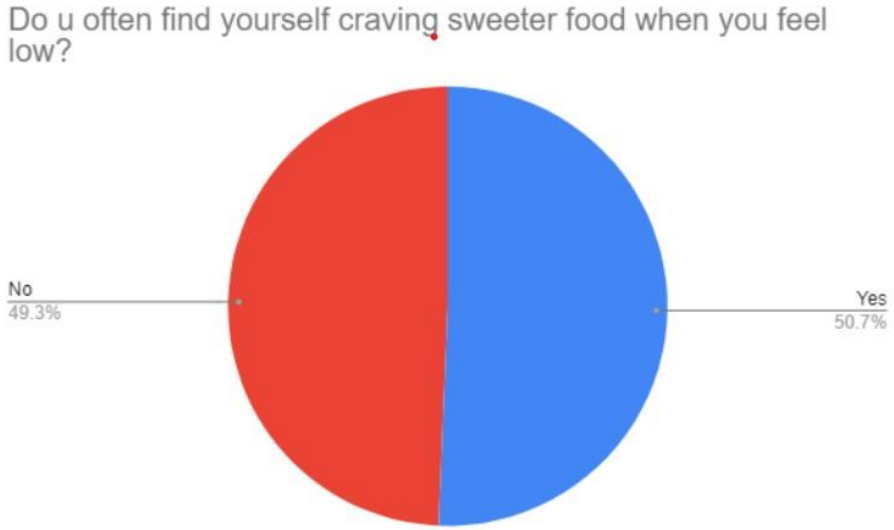


This is the data of an user that how much sleep he takes per night when he/she is under stress.

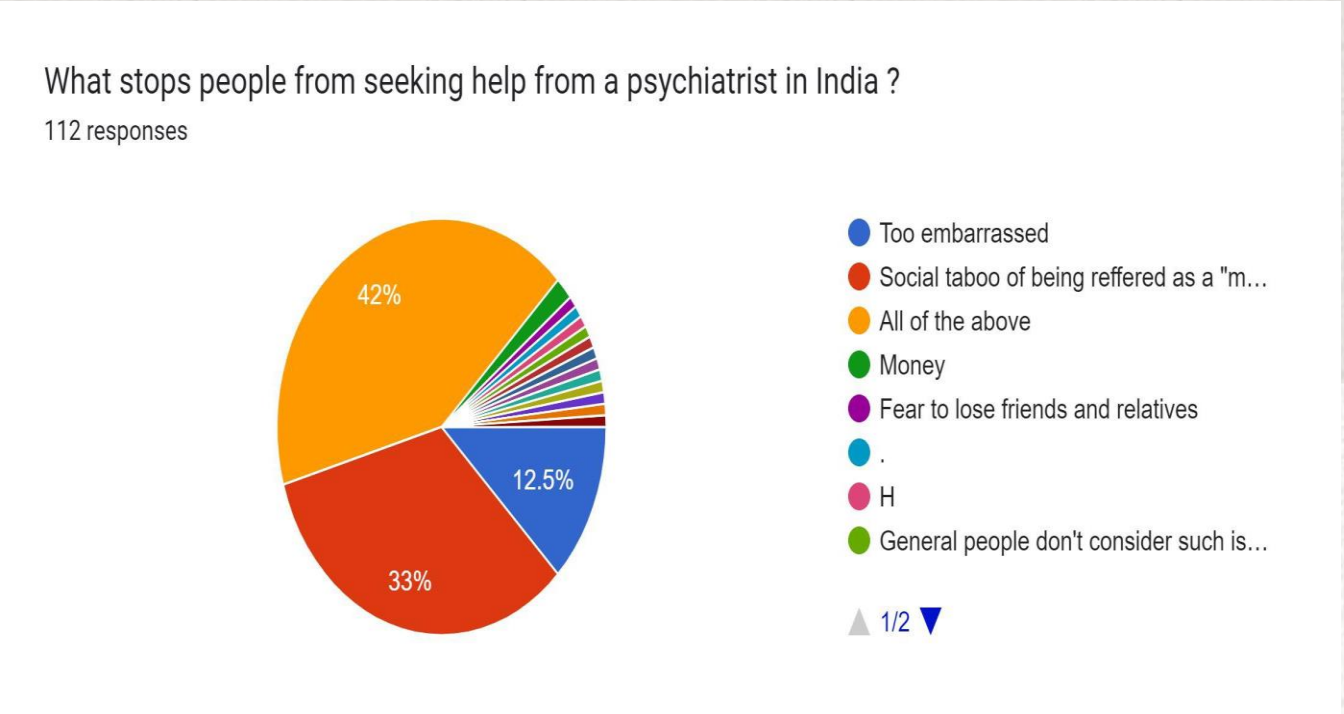
2.2. People neglecting their Health

Our survey finds that the majority of people start neglecting their health and fitness goals and tend to sleep longer than their usual sleep cycle in times they feel sad.





In addition, the above-put chart gives us a result that states that the majority of people tend to order sweeter than usual food if they're feeling low/depressed.



This is the data of the users that what makes them to stop to visit to psychiatrist. In addition, people have a certain amount of trust issues and fear of judgement, while others believe that their problems can't be dealt with. Furthermore, we also asked the m what they might think would help a person in distress or when they're feeling down, to which the majority of the people responded by listening to music. Besides this, they mentioned that talking to a trustworthy person helps them.

What's stop people to visit to psychiatrist ?

In reference to the question above, we also surveyed people regarding the cause of the same one which was:
"People don't even know they need help because it becomes completely normal for them and they take it as occasional mood swings and that they'll feel better after some time"
This is one of the significant things that we're focusing on since it is genuinely something that people are unaware of and unable to differentiate between a mood swing, phase and actual early signs of slipping into depression. We will have a significant focus on the trend line of their behaviour and how much that deviates, and how consistently it happens for

what specific duration. This is the primary area where we are working and studying, making it, in a way, one of the things that motivated us to pick up this project. Because a large number of people are actually unaware of the the distinction among the above stated, we are building the project on the factors that not only distinguish and present to them the weekly status but also, as needed, provide trigger warnings/help to the users.

OBJECTIVE

Our main objective is to solve mental health issues at their roots. As discussed in the problem statement, we claim that detecting mental health issues is the biggest problem. With this significant and audacious goal, we aim to recognise early signs of any mental health issue. Our solution proposes using streaming behavioural data to identify non-temporary trends in user behaviour. By observing and tracking daily logs of various data sources such as their Spotify listening history, youtube streaming history, food orders, social media usage, and fitness and sleep cycle, early signs of depriving mental health can be detected. The user also stays aware of their mental health status and can reach out for help during the initial stages.

GOAL/AIM OF THE STUDY

- Through our proposition, we majorly focus on detecting signs of mental health disorders through everyday mannerisms and behavioural characteristics of a person. This would allow people to seek help early on and reduce the number of extreme cases of clinical depression by a notable number. Timely detection, intervention and effective administration of the the issue can help patients achieve remission, avoid relapses, and lessen the the psychological, physical and financial toll of their illness. When left Untreated or diagnosed very late, depression is a chronic, progressive disorder that increases expenses for consumers, employers, and clients while increasing morbidity and mortality. Most patients do not receive appropriate therapy to achieve remission despite the considerable strain of depression. Therefore, we are trying to nip the problem in the bud. That is to reduce the chances of worsening one's mental health and providing timely treatment

1.7 DATA AND METHODOLOGY (TOOLS AND TECHNIQUES)

1. Data Source

We will be working with the following data sources:

- Spotify Listening History
- YouTube Streaming History
- Logs of Food Orders
- Fitness Tracker Data
- Social Media App Usage

2. Methodology

From each data source, we plan to transform them into a set of scores

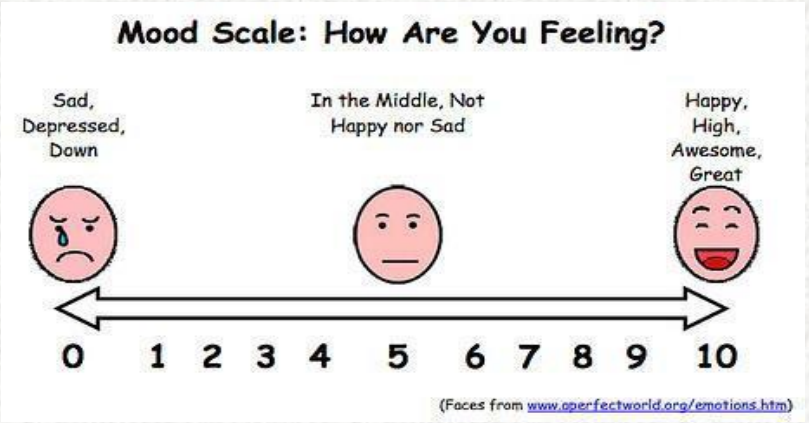
- **Mood score:** Determines the current mood of the user
- **Persistence:** Describes if the current mood has been persisting for a long time
- **Delta:** Describes the direction in the time-averaged current mood score moving (as in getting better or worse)

Music Score(m): Using the HUMS scale (Healthy Unhealthy Music Scale), we calculate the score relating to music and mental health. The questions are divided into 2 categories: healthy and unhealthy, along with their intensities Cronbach's alpha coefficients were .78 for Healthy and .83 for Unhealthy.

Healthiest: 19.5
Unhealthiest: 33.2

Video Streaming Score(v): Similarly, as we calculated the HUMS score, we'll calculate the video streaming score based on Youtube and other video-on-demand search/watch history and their recommendations. This scale ranges from 1 to 10, 10 being the highest level of sadness/distress and 1 being the least of it.

Food(f): using the research facts mentioned above, as people in distress tend to order sweeter food than their usual ordering ways, we monitor and keep track this information and calculate the deviation from their food ordering histories and name this deviation 'f' and use the same to calculate the total the score which we'd be using to achieve our goals. The scale we'll use here is 1 to 5, 5 being the maximum deviation from the user's standard food ordering.



Health and Fitness Score(h): Ranging from 1 to 10, 1 being the lowest and 10 being the highest fitness level, respectively. We track and score from this data from the fitness trackers, taking into account the sleep hours and pulse rate, mainly since it is found that people suffering from anxiety or depression have a lower pulse rate than others. (ref)

Total Mood Score (s) : 0. 55 * v + 0. 28 * m + 0. 14 * h + 0. 3 * f

Time-averaged scores (a): we monitor the data and calculate a bi-weekly score and average it out to find this.

Delta (d): if the deviation from the average goes in a negative direction persistently, this results in a person showing early signs of slipping into depression. In this case, our tool aims to provide an early diagnosis by warning the user about the changes in his mood. If this continues for a longer time or worsens, directed help will be provided to the user.

3. Tools

Since we are solving this problem using our engineering knowledge, technology is a crucial fabric of our formulation. Our plan is multidisciplinary as well as multi-step. We describe each of the following steps individually:

1. Build

Since we have to get the application to as many OS and platforms as possible, we build it in Flutter because that gives us the power to export it directly to Android, iOS, and Universal Windows Platform apps as well as a progressive web application from one source code.

3.2 Operations

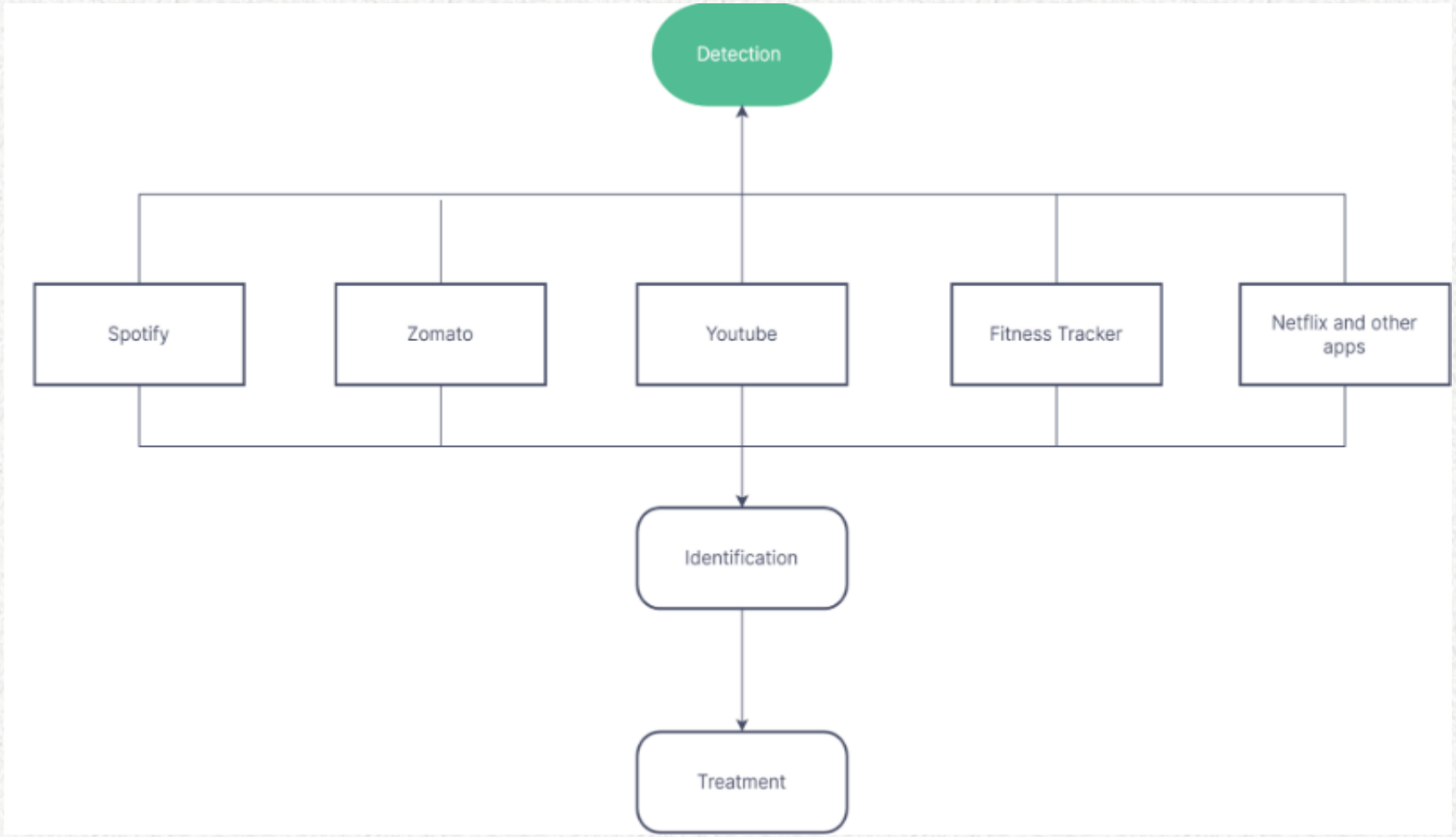
Since our approach is heavily based on analysing tons of data simultaneously from all over the world, we would need a capable cloud computing service as well as a serverless architecture for easy horizontal scaling. We would need access to a real-time database as well as event triggered computation (for example, executing some function, say mood analysis, whenever it detects ingress of new data from a user, or maybe detecting a user's mood is falling into a non-temporary phase, therefore triggering a notification to be sent either to the user's devices or to our service user who is managing the end-user). By service user, we mean we will provide our mood analysis software as a service to NGOs, educational institutions, other mental health applications or companies and other organisations, therefore extending our service to be used by people who aren't our direct consumers. To enable that, we will also need billing and support for our APIs.

3.3 Distribution

To enable proper distribution of our web app, we need to use a hosting service. We would be using Firebase hosting for that, and for native apps, we would use Play Store, App Store and Windows Store for distributing it to end users.

WORK PLAN

(VIABILITY WILL COME HERE, DISCUSS THE COST FOR INVENTION OR DEVELOPMENT)



We would ask the user for authorization scopes for their data sources. For example, authorising APIs for their Spotify and YouTube data. We reduce their data to a simple score for each metric and combine them into three consolidated mood metrics.
Since we work with various data sources, we naturally have outcomes defined at each level. Initially, at the individual level of each data stream. Furthermore and predominantly, combining these individual data to develop field-wide insights.

INDIVIDUAL OUTCOMES

As per the current plan, we are working with the following data sources:

- **Spotify Listening History**

Personally, we have all felt that music defines our mood. We have scoured through multiple research papers to conclude that forming a baseline and trend analysis of your music streaming history can help get insights into your transient mood.

- **YouTube Streaming History**

The media we consume unquestionably impacts our mood and vice versa. Analysing the content in the video and understanding the sentiment of video subtitles can give us insight into what headspace someone may be going towards. Long-term trends in such data can help us distinguish temporary from non-temporary changes in behaviour.

- **Logs of Food Orders**

Stress eating and emotional eating, such terms are very commonly described eating habits in response to mood-related disorders. It might seem unrelated, but we claim processing food orders helps us understand a lot about a person.

- **Social Media App Usage**

We have all been in that place where we are just not feeling
like doing something, but we spend hours scrolling through our Instagram feed.

- **Fitness Tracker Data**

  Similarly, we tend to let go of our health goals when sad.

From each data source, we plan to transform them into a set of scores:

- **Mood score:** Determines the current mood of the user
- **Persistence:** Describes if the current mood has been persisting for a long time
- **Delta**: Describes the direction in the time-averaged current mood score moving (as in getting better or worse)

FIELD-WIDE INSIGHTS

Single sources of data are faulty in their analysis. Combining data from multiple sources will help us understand whether it's a seasonal change or non-temporary. Ways of combining these data are given in full detail in the data and methodology section. Based on this data, we would set up a monitoring service that triggers alerts when a user's metrics have fallen below a certain threshold.

Why would this work?

We understand the several concerns surrounding this idea. First off, how to encourage people to use our service when it may seem like a breach of privacy? We observe that people love to know about themselves and would often enable third-party companies to use their data. For example, we have Spotify Wrapped, which combines a user's yearly listening data to consolidate a report of their listening habits. We also have Google Maps Timeline, which once a month sends users a report of the places they visited and miles they travelled, all by monitoring their location data continuously. Therefore, we package this behind a get-to-know-yourself app which sends the user mood reports once a month. It would contain graphs and charts of their mood metrics and how they change over the months. Enabling this software just for this first-party use case is suboptimal. Therefore we would expose it over an API even for other organisations dealing with mental health. That can include NGOs, educational institutions, research purposes, or any other company. We, of course, wouldn't allow just about anyone to use it. There will be a proper approval and vetting process for an organisation to join our portfolio. In addition, we would also put in the process a proper framework for consent, identity and access management so that a user stays in control of their data.

However, to tackle the specific (and most important) problem of data privacy, we can use the following two approaches to learn from, analyse and use their data:

- Using only a subset of signals or data points, that the user is willing to give, and then extrapolate on that to obtain the latent data.

- Use federated learning so that models are trained on the device, and the learnt parameters are uploaded to the cloud. This way, a user's data never leaves their device, and there's no way to link learnt parameters to individual users.

NOVELTY/INNOVATION OF THE PROPOSED INTERVENTION

- People generally experience a range of emotions during the course of a day, from happiness and satisfaction to fury, grief, and worry. This implies that our data shows not just one emotion but several across several areas. Thus, when charting a single emotion, the resulting graph would not yield desirable results. But with our application, we are not focused on singular emotions rather, all of them combined for analysing the metrics of a user. Continuous study of one's overall mood daily for a long term helps in accurate assessment and differentiating seasonal changes from non-temporary ones.

- Not only are we communicating users' daily metrics and alerting them of the potential onset of the decline in their mental health, but we are also only one step away from providing them with the required consultation and care. Tie up with NGOs, educational institutions, non-profit healthcare institutions, or any other institution that will provide support and guidance to the people who reach out for help.

SUSTAINABILITY

Our proposition, unlike the conventional methods, won't burn up the existing resources but rather save on the cost, time and hassle of going back and forthwith clinical appointments, detection and intervention procedures. The the user-friendly application keeps them updated about their mental well-being from time to time, with no additional inputs required from them. AI is designed in a way to keep up with the evolving trends. The low cloud costs make it possible to sell the backend to various institutions such as NGOs and educational and health organisations so that they can provide proper support and care and use the application up to their requirements. The revenue generated compensates for our operational costs making it economical and feasible

WHAT ARE THE SIGNIFICANT CONSTRAINTS YOUR STUDY WILL FACE?

- **Data noise**

Noisy data can be referred to as meaningless or corrupt data. In simpler words, data can not be interpreted or understood correctly by the processor. Since we are dealing with people here, the data from the signals we are using may be noisy and inconsistent. People, on average, feel changes in emotions within a day ranging from joy and contentment to anger, rage or sadness or anxiety. This means our data depicts not one but multiple emotions of different domains within a day. Thus the graph obtained would be inconsistent when plotting a single emotion. Sometimes, slight changes in moods might be hard to capture and process. Furthermore, a high variance in the neighbouring graphs can be encountered as positive and negative emotions are often experienced simultaneously. But this does not affect our predictions marginally as we are assessing the data in the long run.

People might decide not to use our product because of privacy concerns. We are working with various applications that need to communicate the user's data to quantify and assess the continuous mood graph of the user. But it would be easy to gain the user's trust as government-established norms and procedures would be followed.

Difficulty with traction

- Many people refuse to be under mental health watch, as it is still a taboo in many societies. In many places, there is a lack of education and awareness about it. Mental health is often not taken up as seriously as physical health, until the individual's condition worsens. The prevalence of stigma and discrimination toward people with mental illness makes it difficult to have a transparent conversation about how one feels.

EXPECTED OUTCOMES

- As discussed throughout, it is expected that more and more people will tune in to our application to keep a check on their mental health. This would not only help people determine any signs of declining mental health but also promote the concept of taking care of one's psychological well-being, which is considered taboo in many societies to date. Late diagnosis of these disorders are detrimental to an individual in multiple aspects, including physical and financial problems. Combining the data streams and communicating the respective information with the user will provide an in-time credible self-diagnosis of their mental well-being. The continuous tracking of an individual's emotional disposition ensures the accuracy of the diagnosis by shrinking down the possibility of temporary or seasonal mood swings. Thus detecting the issues prematurely and providing care at the earliest is expected.

CONCLUSION AND POLICY IMPLICATIONS

Our research shows that people's behaviours are much more prone to their current state of mind. Through our survey, we do find that the majority of people feel the same way about specific behaviours they exude when they are in a depressed state. Further, the same cohort of people who belong to the majority of one parameter also belongs to the majority of another parameter, proving that omnichannel data does have mood information latent inside it, waiting to be discovered. While our method of consolidating the individual scores into 3 key signifiers is one, but not the only, way to mine this information from the unstructured data.

.We don't deny that other age groups also face this problem, but we found that most people who related to the questions we asked were in the age range of 15-25, and our research & proposed solutions are most suited to this demographic.We not only use our method for first-party uses, but we also provide it as a service to mental health-related institutions to enable a wider scope of usage. We are strongly opinionated towards leveraging technology to detect the early onset of depression. We hope our research does not just further the cause but also inspires more attention, research and action in the domain of using technology and behaviour trendlines of indirect data to detect something increasingly affecting a record number of teens and young adults.

CONTRIBUTION OF EACH STUDENT

We all have made this report together with equal inputs throughout the report. With group discussions, we decided to tackle the problem of detection and differentiating in the early stages of a person slipping into depression. We surveyed how our friends and peers felt about the discussed situation, and after getting their answers, we decided to propose a solution. We divided work equally among us, did proper research on our part and contributed towards the report while discussing and reviewing all the sections. Everything is created by the team members themselves.

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